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REFERENCE 20

Thoms, Bryn, R.G., August 21, 2008, WR Cleanup Program, State of Oregon, Department of Environmental Quality memorandum to Max Rosenberg, R.G., WR Cleanup Manager regarding Black Butte Mine Mercury Loading Assessment Results, 84 pages.

State of Oregon
Department of Environmental Quality Memorandum

To: **Max Rosenberg, R.G.**
WR Cleanup Manager

Date: August 21, 2008

From: **Bryn Thoms, R.G.**
WR Cleanup Program

Subject: **Black Butte Mine Mercury Loading Assessment Results**

The following document presents the results of the mercury loading assessment conducted by DEQ on 23rd through June 26th, 2008. The purpose of the assessment is to determine the relative mercury (Hg) contribution from the various tributaries in the Coast Fork Willamette River (CFW) watershed above Cottage Grove Reservoir (CG Res.). Results of the assessment will provide a quantitative evaluation of the need for further cleanup work on Furnace Creek at the former Black Butte Mine and thus support a recommendation to list the site on EPA's National Priorities List and refer the project to EPA's Remedial Program for further assessment and cleanup. The surface water assessment was conducted following the DEQ-approved workplan (attached). The workplan also provides site and project background information, site and sample location information, and details on Hg load calculations.

The following is a summary of what data were collected and why:

- **Hg in Surface Water** - 21 surface water samples were collected for Total Hg analysis using EPA Method 1631 with a detection limit of 5 nanograms per liter (ng/L). Samples were collected from various tributaries throughout the watershed and results were used to calculate Hg loads from each of the tributaries.
- **Hg in Sediment** - 20 sediment samples were collected for Hg analysis using EPA Method 7471A with a detection limit of 0.1 milligrams per kilogram (mg/Kg). Sediment samples were co-located with surface water samples to qualitatively identify Hg loads within each of the tributaries.
- **TSS in Surface Water** - 21 surface water samples were collected for Total Suspended Solids (TSS) using EPA Method 160.2 with a detection limit that varied from 3.4 to 10 milligrams per liter (mg/L). Aliquots from the surface water samples collected for Hg were collected for TSS in an attempt to utilize TSS analysis as a surrogate for Total Hg, which was utilized in the Willamette TMDL model.
- **Discharge (Q)** – 16 stream locations co-located at surface water sample locations were assessed for stream discharge parameters following USGS stream survey methods. These parameters included cross-sectional area measurements coupled with stream velocity data. Smaller streams were assessed by timing a 5-gallon bucket while being filled at the closest natural weir.
- **pH, Conductivity, and Temperature in Surface Water** – Each of the locations assessed for Hg in surface water were also assessed with field instrumentation for pH, conductivity, and temperature of the surface water. These parameters were collected as a quality assurance measurement to assess the representative-ness of the surface water sample and to identify potential anomalies.

One sample location (SR1) was not sampled due to limited access. Sediment was not collected at sample location HOB1 because there was no sediment present. Also several of the sample locations were not assessed for discharge because they were located close to other discharge sample locations and weren't expected to significantly differ. A summary of the sampling activities, results, discharge calculations, and

relative mercury loads are presented in the attached document "Sampling around Black Butte", prepared by Seth Sadofsky, July 25, 2008.

Table 1 presents the analytical results, the calculated discharge measurements, and an estimated annual Hg load. The annual load was calculated using the discharge data generated during the sampling event (June, 2008). Discharge fluctuates seasonally and thus the estimated annual load is likely not representative but it does present a relative correlation between Hg contributions from each stream/tributary. Historical discharge data from the CFW in London, north of the site, suggests that springtime discharge approximates average annual discharge. Annual load calculations are used as matter of convention and also for ease of comparison to Willamette TMDL data. It should be noted that using June discharge data in the annual load calculations, likely biases the annual load calculations low. Figure 1 presents the sample locations and associated Hg concentrations in surface water and sediment. Figure 2 presents the estimated annual mercury loads in grams per year (g/yr) for most of the tributaries above CG Res.

Surface Water Analytical Results

Hg concentrations in surface water ranged from non-detect at 5 nanograms/liter (ng/L) in various tributaries outside of the mineralized zones to 25,600 ng/L in Furnace Creek located at F1, below the old furnace mill. It should be noted, that sample location F1 and G1 had duplicate samples for quality assurance purposes. The primary and duplicate sample results were averaged for the load calculations and are presented in the attached table and figures.

The surface water Hg results are presented below in 3 different groups based on the location relative to the mine site:

- Mill Site Samples – Includes sample locations F1, FBG, D1, DBG, G0.5, G1, G1.4, G1.5, and G2. These are the most elevated sample results from the study and they include surface water that is influenced predominantly by the mill site area (tailings and waste rock) and to a lesser degree, the localized naturally-occurring mineralization.
- Mineralized Zone Samples – Includes sample locations GBG, GBG2, LR1, HOB1, and H1. The tributaries associated with these samples are potentially influenced by naturally-occurring mineralization only. There may be a prospect (exploratory test pitting) located upstream of these sample locations but there are no historical reports of mining upstream of these locations.
- Non-Mineralized Zone Sample – Includes sample locations BR1, C1, A1, J1, CED1, and W1. Other than one sample in this set, these had no detections of mercury and are most likely not influenced by naturally-occurring mineralization. Sample site CFW1 is presented in this group and it likely is influenced by mine drainage and mineralized soil upstream, during storm events.

The term "mineralization" is used in this document to refer to any area with Hg mineralization (cinnabar, meta-cinnabar), Hg gangue minerals (pyrite, marcasite, arsenopyrite, other sulfides), and evidence of hydrothermal alteration (bleached rock, fault gouge, silicious deposits).

Mill Site Sample Locations

As stated above, Hg was detected at 25,600 ng/L in Furnace Creek below the tailings (F1). This was the highest Hg concentration detected in this assessment and is 3 orders of magnitude greater any other sample results in the assessment. Approximately 1000 feet of Furnace Creek runs through tailings from Black Butte mine which have Hg in soil at 100 to 2000 milligrams per kilogram (mg/Kg). The duplicate sample for F1 had a Hg concentration of 14000 ng/L which suggests that there is some variability within duplicate samples most likely due to the low detection limits and inherent variability within the stream system. The sample collected at F1 from the pre-removal assessment in May 2007 had a concentration of 3050 ng/L.

The background surface water sample (FBG) in Furnace Creek (above the mill tailings) had a Hg concentration of 44.9 ng/L. The same sample location was sampled during the pre-removal assessment in May 2007 and Hg was detected at 18 ng/L. This sample location is above the mill tailings but downstream of the ore body exposed at the surface of Black Butte. This sample location is likely affected by mineralized soil as well as minor anthropogenic sources of Hg related to historical mine operations that took place above this location. The potential mine-related sources are crusher waste (ore), road construction with tailings and waste rock, and tramway spills (ore).

The surface water sample collected in Dennis Creek (D1), downstream of the main tailings pile, had a Hg concentration of 10.0 ng/L and the pre-removal sample collected in the same location in May 2007 had a Hg concentration of 9.9 ng/L. The background sample collected above the main tailings pile in Dennis Creek (DBG) had a concentration of 5.28 ng/L and was 8.49 ng/L during the pre-removal assessment in May 2007. Again, the background samples may be affected by both the mineralized soil and potential minor mine-related sources as identified above.

Dennis Creek and Furnace Creek are both tributaries to Garoutte Creek which was sampled in several locations (G0.5, G1, G1.4, G1.5, and G2). Background samples were collected on Garoutte Creek (GBG and GBG2) and are presented in the section below. The numerical reference in the sample ID simply identifies the location relative to Furnace Creek or Dennis Creek (see Figure 1):

- G0.5 is about 200 feet downstream of the confluence of Furnace Creek and Garoutte Creek
- G1 is about 50 feet downstream of the confluence of Dennis Creek and Garoutte Creek
- G1.4 is about 1,200 feet downstream of the confluence of Dennis Creek and Garoutte Creek
- G1.5 is about 3,000 feet downstream of the confluence of Dennis Creek and Garoutte Creek
- G2 is about 4000 feet downstream of the confluence of Dennis Creek and Garoutte Creek

Mineralized Zone Samples

These samples were collected hydraulically above influences from the Black Butte Mine area but are located in areas that are likely influenced by the local mineralization associated with the Black Butte-Elkhead Hg district. Hg was not detected in water samples collected from GBG and GBG2 on Garoutte Creek. However, Hg was detected at 11.2 ng/L in the water sample collected from LR1 (Little River). A tributary to Little River is referred to as Cinnabar Creek, which suggests that there may be ore-grade material within the tributary's drainage. The non-detects in Garoutte Creek samples GBG and GBG2 suggests that the moderately elevated Hg concentration detected in LR1 attenuates before reaching GBG2. This is likely due to dilution from the headwaters of Garoutte Creek which does not have Hg mineralization within the drainage area.

Samples collected from Hobart Creek (HOB1) and Hambrick Creek (H1), both of which may have drainage from the Hobart Butte mineralized zone, had no detections of Hg. The Hobart Butte mineralized zone has less mineralization and more kaolin clay than the southern deposits that make up Black Butte and Cinnabar Butte zones (Derkey, 1965). Mineralized zones presented on the Figures, were retraced in GIS using a 1:24000 scale geologic map from the USGS Bulletin #850, "Quicksilver Deposits of Southwestern Oregon".

Non-Mineralized Zone Samples

These samples were collected from tributaries of the Coast Fork Willamette River downstream distal to the mine site and from drainages with no known mineralization or historical Hg prospecting or mining. . This may be the reason why there was no Hg detected in samples from water draining the zone. The only sample within this group that had a detection of Hg was the sample collected from Anderson Creek, A1 which had a concentration of 9.55 ng/L. Anderson Creek is located immediately north of Hobart Butte and because of its proximity, there may be some limited alteration or mineralization in this drainage associated with the Hobart Butte deposit that is not identified on the geologic map.

Sediment Analytical Results

Sediment was collected from the same sample locations as the surface water sample locations and was analyzed for Hg. Sediment results are presented on the attached table only. In general, sediment results correlated well with surface water results. Hg was detected at 70.2 and 173 mg/Kg at sample locations F1 and the F1 duplicate, respectively. Hg was detected at 49.6 mg/Kg at D1, and 159 at G0.5 mg/kg (just downstream of the mouth of Furnace Creek). Background sample FBG, DBG, and GBG had detections of Hg ranging from 1.92 and 4.82 mg/Kg. This suggests that Furnace Creek and Dennis Creek are both major contributors of Hg to Garoutte Creek and likely have been for some time. Hg concentrations in sediment represent a timeframe of deposition that is likely longer than one season and thus, Dennis and Furnace Creeks have probably been major contributors of Hg to the Garoutte Creek for several years or decades.

Hg in Garoutte Creek sediment is high (159 mg/Kg) at G0.5 but then drops to a range of 0.337 to 1.88 mg/Kg at G1, G1.4, G1.5, and G2 with no obvious trend. The next closest downstream sample receiving water from Garoutte Creek is the sample location CFW1 near CG Res., which had a Hg concentration in sediment of 0.302 mg/Kg. An historical sediment sample collected in September of 2002 at the London sampling site on the CFW, had a Hg concentration of 0.451 mg/Kg. This suggests that Hg in sediment within Garoutte Creek and the CFW has a fairly consistent Hg concentration.

Hg in sediment samples collected from tributaries to the CFW other than Garoutte Creek (BR1, C1, H1, HOB1, A1, and J1) were all non-detect at 0.1 mg/Kg, suggesting that the only significant source of Hg to the CFW is from Garoutte Creek and the corresponding tailings and waste rocks piles draining to Garoutte Creek tributaries (Furnace and Dennis Creeks). The surface water sample collected at A1 in Anderson Creek had a Hg concentration of 9.55 ng/L yet the co-located sediment sample had no detection of Hg. The surface water result appears to be somewhat anomalous and the result coupled with the sediment result suggests that Anderson Creek is a limited temporal source.

Total Suspended Solids (TSS)

TSS was collected from surface water at the same locations as the Hg-in-surface water and the Hg-in-sediment sample locations. All of the samples, except the sample from F1, had detections of TSS at 3.4 to 14 mg/L or had not detections of TSS below the 3.4 mg/L detection limit. The sample collected at F1 had a detection of TSS at 116 mg/L, which supports the Hg transport model in that the form of Hg that is moving downstream is particulate Hg or Hg compounds adsorbed to humic material. Because TSS increases during storm events, one would expect to see a similar increase in Hg in surface water during storm events.

Discharge (Q)

Surface water sample locations were assessed for discharge (Q). Q was determined using standard stream-cross-section measurements coupled with averaged stream flow across that cross-sectional area. Some of the sites were close to other sites that were measured for discharge and thus the discharge was extrapolated to those locations. The smallest Q in the assessment was reported at F1, 4.5 gallons per minute or 0.01 cubic feet per second (cfs). The largest Q in the assessment was reported at CFW1 on the Coast Fork Willamette at 53 cfs. The second largest Q (40.5 cfs) was reported at BR1 on the Big River just upstream of the confluence with Garoutte Creek. The third largest Q (22 cfs) was reported at G2 on Garoutte Creek just upstream of the confluence with Big River.

Historical discharge measurements reported at the London gauging station on the CFW near the mouth of Anderson Creek on Figure 1, range from 61 cfs in October 2002, 79 cfs in June 2003, 351 cfs in March 2003, and 405 cfs in December 2002. Discharge measurements of the CFW collected in June 2008 during this assessment are similar to historical results for late spring.

pH, Conductivity, and Temperature

Surface water sample locations were assessed in the field for pH, conductivity, and temperature for quality assurance purposes. There were no field parameter anomalies or unexpected trends, suggesting that the surface water samples collected for Hg analysis were representative of the stream system.

pH remained fairly consistent throughout the study area and was generally in the upper 7 range.

Conductivity was reported at 275 and 208 microsiemens (µS) on Dennis Creek at D1 and DBG, respectively, which were the most elevated results in the study. This may be related to dissolved metals associated with discharge from the Dennis Creek adit, or it may be related to the dissolved metals in groundwater beneath the mine site discharging to Dennis Creek. Adit discharge and groundwater were assessed in a previous study and dissolved metals were not found to be elevated above human health screening levels and thus further assessment was not warranted. Conductivity ranged from about 100 to about 120 µS in samples collected at FBG, F1, G1, G1.4, G1.5, G2, GBG, GBG2, LR1, and W1. Other than W1, these samples are all influenced by drainage from the mine site or from mineralized soil and as such, there may be additional dissolved metals associated with Hg or sulfides in these samples. Conductivities from the rest of the sites, predominantly the tributaries of the CFW distal to the mine site and mineralized zones (BR1, C1, H1, HOB1, A1, CED1, J1, and CFW1) ranged from about 55 to 94 µS.

Temperature was reported at 12° to 16° Celsius throughout the study and there were no anomalies. Streams higher in elevation and with more tree cover had lower temperatures, and streams lower in elevation with more solar exposure had higher temperatures.

Mercury Load Calculations

The specifics of how mercury loads were calculated are presented in the Mercury Assessment Workplan (attached). As a matter of convention and comparison to Willamette TMDL studies, the mercury load unit is presented in grams per year (g/yr). It should be noted that the surface water samples and the discharge data which make up the load calculation is based on a one-time instantaneous sample and is not necessarily representative of the actual annual load. The mercury loads presented in the attached table are estimates based on the data collected during the June 2008 assessment. Figure 2 presents the load calculations in the watershed. It should be noted that the loads calculated from samples with no mercury detected, used half the detection limit (2.5 ng/L) in the load calculation as a conservative measure. Those results are presented on the figure in white boxes and gray text, as opposed to the loads that were calculated using actual Hg concentrations which are presented in yellow boxes and black text.

The Hg load calculated for F1 in Furnace Creek (average of the primary and duplicate result- 177.5 g/yr) was the highest in the study. The background furnace creek load (FBG) was calculated at 0.4 g/yr. Dennis Creek load at D1 was calculated at 8.2 g/yr and the background load at DBG was calculated at 4.3 g/yr. Hg loads for sites along Garoutte Creek (G0.5, G1, G1.4, G1.5, and G2) below the confluence with Furnace Creek ranged from 44 g/yr at G1.4 which was a non-detect sample to 122 g/yr. The background sites (GBG and GBG2) on Garoutte Creek had no detects of Hg, but utilizing half the detection limit in the load calculation

provides 14 and 31 g/yr. Little River (LR1) load was calculated at 79 g/yr which is most likely related to the naturally-occurring mineralized zone upstream.

Hg was not detected at the remaining sample locations within the watershed (BR1, C1, H1, HOB1, J1, CED1, and W1), except at Anderson Creek (A1). Utilizing half the detection limit for those samples and the Hg concentration from A1, the calculated loads from those tributaries, range from 0.3 to 11 g/yr.
Hg was not detected in the CFW at sample site CFW1. Utilizing half the detection limit in the load calculation provides a load of 120 g/yr. Analysis for five historical samples collected from the CFW at London had lower detection limits than this study. Those sample results ranged from 3.5 to 6.7 ng/L and corresponding load calculations ranged from 218 g/yr in October 2002 to 2434 g/yr in December 2002. This suggests that utilizing half the detection limit for a Hg concentration for samples within the CFW is a relatively close approximation to the historical Hg concentrations.

Relative Hg loads are presented in pie charts in the memorandum from Seth Sadofsky (attached). In general, if half the detection limit is used for a Hg concentration at sites that had non-detects, Furnace Creek contributes about 50% of the Hg to the CFW. If sites with non-detects are assumed to contain no Hg, Furnace creek contributes about 75% of the Hg to the CFW. The results of the 2008 surface water assessment clearly indicate that Furnace Creek is a significant contributor of Hg to the system and additional removal actions or remedial actions are warranted.

Conclusions and Recommendations

The fieldwork for the surface water assessment for Black Butte Mine and surrounding Coast Fork Willamette watershed was conducted in June 2008 with limited deviations from the workplan. Samples were collected for a variety of parameters and quality assurance procedures support the representative-ness of samples and indicate that the assessment was completed with a high level of quality.

Hg concentrations in surface water and sediment of Furnace Creek and associated relative Hg loads in the watershed indicate that Furnace Creek is a significant contributor of Hg to the Coast Fork Willamette River and potentially CG Res. The Black Butte Mine Cleanup Team (myself and Seth Sadofsky) recommends that the site be referred to the EPA's Remedial Program for additional assessment and remedial action to address Hg releases from Furnace Creek. In addition, the team recommends collecting surface water samples for Hg analysis and discharge information during a significant fall storm event in 2008 from a subset of the sample locations. Presumably there will be more Hg detections throughout the watershed during a storm event. The results will provide a better understanding of the seasonal fluctuations in Hg loads, as well as a better understanding of the impacts from the mine site to CG Res.

References:

Derkey, Robert E.; *Geology of the Black Butte Mercury Mine;* University of Montana Thesis, 1965

Wells, Francis G. and Aaron C. Waters; *Quicksilver Deposits of Southwestern Oregon*; USGS Bulletin #850, 1934

Attachments:

Table of Analytical Results
Figure 1, Mercury Concentrations in Surface Water
Figure 2, Estimated Annual Mercury Loads
Memorandum from Seth Sadofsky Summarizing Fieldwork and Data
Analytical Reports
Surface Water Assessment Workplan

Analytical Results
Surface Water Assessment 2008
Black Butte Mine

Site ID	Stream Name	Comment	Sampled Date	T. Hg (ng/L) in Water EPA Method 1631	T. Hg (mg/Kg) in Sediment EPA Method 7471A	TSS (mg/L) in water EPA Method 160.2	Discharge (cfs)*	Estimated Hg Load g/year	Hg Load Ave.** g/year
2008 Surface Water Assessment									
F1	Fumace Creek	downstream of tailings	6/23/2008	25600	70.2	116	0.01	228.9	177.5
F1 Dup	Fumace Creek	downstream of tailings	6/23/2008	14100	173	47.3	0.01	126.1	–
FBG	Fumace Creek	upstream of tailings	6/23/2008	44.9	2.2	14	0.01	0.4	–
D1	Dennis Creek	downstream of tailings	6/23/2008	10	49.6	3.64	0.915	8.2	–
DBG	Dennis Creek	upstream of tailings	6/23/2008	5.28	4.82	3.52	0.915	4.3	–
G0.5	Garoutte Creek	downstream of Fumace	6/25/2008	6.19	159	3.46	14	77.5	–
G1	Garoutte Creek	downstream of Dennis	6/23/2008	6.25	0.337	3.45	19.6	109.5	107
G1 Dup	Garoutte Creek	downstream of Dennis	6/23/2008	5.96	0.462	6.9	19.6	104.5	–
G1.4	Garoutte Creek	downstream of Dennis	6/25/2008	<5	1.88	3.42	19.6	43.8	–
G1.5	Garoutte Creek	downstream of Dennis	6/23/2008	5.53	0.618	3.45	19.6	96.9	–
G2	Garoutte Creek	downstream of Dennis	6/23/2008	6.33	0.706	3.39	21.6	122.3	–
GBG	Garoutte Creek	background	6/25/2008	<5	1.92	3.42	14	31.3	–
GBG2	Garoutte Creek	background	6/25/2008	<5	<0.1	6.8	6.4	14.3	–
LR1	Little River	upstream of site	6/25/2008	11.2	0.201	3.42	7.9	79.1	–
BR1	Big River	background	6/23/2008	<5	<0.1	<1	40.5	90.5	–
C1	Combs Creek	background	6/23/2008	<5	<0.1	<1	2.3	5.1	–
W1	Wilson Creek	background	6/25/2008	<5	<0.1	3.36	4.9	11.0	–
H1	Hambrick Creek	background	6/25/2008	<5	<0.1	3.47	0.41	0.9	–
HOB1	Hobart Creek	background	6/25/2008	<5	NA	3.53	0.8	1.8	–
A1	Anderson Creek	background	6/25/2008	9.55	<0.1	13.9	0.48	4.1	–
CED1	Cedar Creek	background	6/26/2008	<5	<0.1	<1	4.62	10.3	–
J1	Johnson Creek	background	6/26/2008	<5	<0.1	8.13	0.12	0.3	–
CFW1	Coast Fork Willamett	background	6/26/2008	<5	0.302	<1	53.28	119.1	–
2007 Pre-Removal Assessment									
F1	Fumace Creek	downstream of tailings	4/4/2007	3050	120	NA	0.033	90.0	–
FBG	Fumace Creek	upstream of tailings	4/4/2007	18	1.67	NA	0.033	0.53	–
D1	Dennis Creek	downstream of tailings	4/4/2007	9.9	1.65	NA	3.2	28.3	28.25
D1 Dup	Duplicate of D1		4/4/2007	9.84	1.29	NA	3.2	28.2	–
DBG	Dennis Creek	upstream of tailings	4/4/2007	8.42	2.02	NA	3.2	24.1	–
G1	Garoutte Creek		4/4/2007	8.76	1.27	NA	43	336.8	–
GBG	Garoutte Creek	upstream of tailings	4/4/2007	<5	1.29	NA	43	96.1	–
T1	Transfer Blank	air tranfser	4/4/2007	<5	NA	NA	NA	NA	–
Historical Samples									
Dennis Mouth	Dennis Creek	near D1	10/7/2002	6.13	NA	<2	NA	NA	–
Dennis Mouth	Dennis Creek	near D1	12/12/2002	9.94	NA	<2	NA	NA	–
Dennis Mouth	Dennis Creek	near D1	3/19/2003	12.9	NA	2.6	NA	NA	–
Dennis Mouth	Dennis Creek	near D1	6/18/2003	18.5	NA	3	NA	NA	–
CF at London	CF Willamette		9/3/2002	NA	0.451	NA	NA	NA	–
CF at London	CF Willamette		10/7/2002	3.99	NA	<2	61	218	–
CF at London	CF Willamette		12/12/2002	6.72	NA	<2	405	2434	–
CF at London	CF Willamette		3/19/2003	4.31	NA	<2	351	1353	–
CF at London	CF Willamette		6/18/2003	3.51	NA	<2	79	248	–
CF at London	CF Willamette		6/18/2003	3.75	NA	<2	79	265	–

Note:
Comment - "background" refers to location of sample site relative to nearby source watershed
Comment - "upstream/downstream" refers to location of sample site relative to nearby millsite source
T. Hg - Total Mercury
ng/L - nanograms per liter
mg/Kg - milligrams per kilogram
mg/L - milligrams per liter
EPA Method 1631 detection limit - 5 ng/L
EPA Method 7471A detection limit - 0.1 mg/Kg
* Discharge - Stream discharge (Q) in cubic feet per second (cfs), calculated using flow meter and cross-sectional area of stream channel
Discharge results for CF at London from 10/02 to 6/03 are monthly means calculated from USGS historical data for the month the Hg sample was collected.
Smaller streams were analyzed for discharge using a 5-gallon bucket, stopwatch, and nearby natural weir.
Air transfer - Lab DI water transferred from lab bottle to sample bottle following method desrcibed in workplan
Hg Load - Annual load in grams (g) is based on discharge remaining the same throughout the year, thus it is an estimate
** Hg load average is for the samples that had a duplicate sample analysis completed. The result is the average of the primary and duplicate sample result.
<5 - Less than the detection limit of 5
Yellow or shaded background rows indicate samples that had a mercury detection above the method reporting limit and had a discharge measurement.
NA -not available, not analyzed, or not applicable

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Site Name: Black Butte Mine Federal Docket File (BUTDF)

Figure 1, Mercury Concentrations (nanograms/liter) June 2008, Coast Fork Willamette Watershed, Black Butte Mine Surface Water Assessment.

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Figure 2, Estimated Annual Mercury Loads 2008, Coast Fork Willamette Watershed, Black Butte Mine Surface Water Assessment.

State of Oregon
Department of Environmental Quality Memorandum

To: **Bryn Thoms** **Date: 7/25/08**

From: **Seth Sadofsky**

Subject: **Sampling around Black Butte Mine**

On Monday the 23rd of June,Ian Balcom and I eft the Eugene DEQ Office at approximately 8 AM with appropriate field gear for sampling stream water and sediment for mercury concentrations around Black Butte Mine in order to execute the sampling plan (Mercury Assessment Workplan Coast Fork Willamette River & Black Butte Mine, Bryn Thoms, 5/5/08). After scoping out some of the distal sampling sites and purchasing ice at the London Store, we proceeded to the main site and greeted Michael Pooler, the caretaker of the property for the L&M Company.

Gauging was done using a Marsh-McBirney type flow meter and standard methods with velocity measured at 0.6 of the depth of the stream and a sufficient number of locations across the stream to collect a representative cross section. Water samples for Hg were collected using EPA method 1669 (Clean hands/dirty hands) and sample containers had been supplied double bagged by the laboratory. Sampling for TSS used standard methods. Soil sampling was done wearing powder-free nitrile gloves and a new disposable scoop was used for each sample.

We then began the process of sampling and gauging at Dennis Creek. We gauged D1 in the culvert (same as 2007 location) and collected samples of water and sediment at 10:05. GPS was not successful at this site due to trees, but the site exactly matched the workplan and the 2007 sample site. pH, temperature, and conductivity are presented in the attached table. We then proceeded about ¼ mile up the logging road to collect sample DBD at a spot where the road and stream are adjacent. Samples were collected at the DBG site at 10:35. Field parameters and GPS are included on the attached tables.

After we completed sampling at Dennis Creek, we then proceeded to the Furnace Creek. Access is more difficult at Furnace Creek then in most sampling locations, the summer/fall 2007 regrading work left a large area of relatively even surfaces (large gravel with few trees between the road and Furnace Creek, we went to the top of this area to hike a short distance through relatively young trees to get to the FBG site. Parameters and GPS readings are on the attached tables. GPS was not possible in the creek are due to tree cover and was collected at the jeep.We then drove down to the access point for the F1 site, this seems to be the same as the site we sampled in 2007, though vegetation is more abundant in June. We collected a transfer blank (T1) at the Jeep before proceeding to the sampling site. We were able to find a small (~3-4' high) waterfall in which we could place a bucket (see pictures) to gauge this section of stream. I believe that this was quite close, or possible slightly downstream (<50') of the 2007 site. Duplicate samples were collected at the F1 site (F1D).

We then proceeded to the G1 site, approximately the same site as 2007. G1 samples were collected at 13:15. after gauging the stream by measuring stream width, then depth and velocity at 9 locations across the stream (data in attached table), duplicate samples (G1D) were collected at 13:40.

We then proceeded to the first bridge on London Road and designated it the G1.5 site. After further examination of the map and reconnaissance, it appears that the sample labeled G1.5 is truly at the location designated G1.75 on the workplan. Samples of G1.5 were collected at 14:20 and this section was not gauged.

We then proceeded to the BR1 site just above the confluence of the Garroutte Creek and the Big River. The Big River was gauged at a point that is 38.6' wide. We measured depth and velocity at 11 locations across the stream. BR1 samples were collected at 15:15. After placing the samples on ice, we walked over to the G2 site, on the Garroutte Creek just upstream of the Big River. We had to cross a small section of private property to reach the stream, we approached the house to ask permission but no one was home and we proceeded to collect our samples.the Garroutte Creek is 20' wide at this site and we measure depth and velocity at 8 locations across the stream. G2 samples were collected at 1555.

We then proceeded to the C1 site, a small culvert crossing London Road, where we measured discharge in a culvert and collected samples at 1620. After collecting this sample we left the site.

We were not able to go to the site on Tuesday the 24th of June, so sampling continued on Wednesday the 25th. Before sampling on the 25th we stopped at the Weyerhauser office in Gresham to pick up a permit to work on their land and were instructed on the rules of the lumber roads. We proceeded to Cottage Grove Reservoir and the first sample was collected at the W1 site on Wilson creek, adjacent to the bridge and just East of the Cottage Grove Reservior. Sample W1 was collected at 9:40 AM. The stream is 19' wide and was gauged at 7 sites across the stream. A transfer blank (TB2) was also collected at this site to reflect a location distal from the mine site.

We then drove to the G0.5 site on Land and Timber CO property just north of the bridge at the entrance to this property. G0.5 samples were collected at 10:20. We did not gauge this section because it should be within error of GBG and G1 sites. We then drove up the WeyCo road to find an access point to the creek for the GRG sample. Due to tree cover GPS data was collected at the parking place and we walked into the creek, the sampling and gauging site was about 100m ENE of the parking place, and probably 100-200 m south of the 2007 GBG site. Samples were collected at 11:10 AM.

We then proceeded up the WeyCo road to the GRG2 and LR1 sites. We parked near the confluence of the Little River and Garroutte Creek to collect LR1 and GBG2 samples. GPS data was collected at the jeep parking space and gauging and sample collection of both creeks were done within ~50 above the confluence, GBG2 samples were collected at 11:50 and LR1 samples were collected at 12:05.

After work was complete at GBG2 and LR1 and a short lunch break we proceeded to the G1.5 site. This site is where G1.5 is shown on the workplan and is designated G1.4 (reasons above). GPS data should be correct as it was collected at the site. This site was not gauged because there are not tributaries between G1 and G2.

We then proceeded to the Humboldt Creek site (H1). After some reconnaissance we located the 4' wide culvert under the WeyCo road and proceeded to collect samples and gauge the stream. Then to the Hobart Creek site (HOB1), also a 4' culvert under London road, where we gauged the stream and collected samples. We did not collect a sediment sample at this site because there was no sediment present. We then proceeded to the A1 site (Andersen Creek). This site was accessed from the yard of 72770 London road with permission of the resident. Samples were collected at 15:15. This was the final sample of the day.

On Thursday the 26th of June we proceeded to the site and began by gauging and sampling the CED1 site on Cedar Creek. This site is at a bridge under the main road near Cottage Grove Reservoir. We the proceeded to site J1, about 20' upstream of the culvert where the Johnson Creek crosses the WeyCo Road. Samples were collected and we gauged the stream at tgis site. We were unable to find site SR1and therefore did not sample that site. Finally, we searched for the best site to sample the Coast Fork Willamette just above Cottage Grover Reservoir. The site marked on the map was too deep to wade across, and the water was barely moving, therefore not appropriate for gauging. We searched both London Road and the Weyco Road for appropriate access and settled on parking on the side of London road south of the reservoir and north of Numbers Creek and H Taylor Creek (see map). The river was 67' wide at this site and we gauged depth and velocity at 15 locations across the stream. This concluded the sampling and all samples were submitted to TestAmerica.

Sampled sites, locations and field parameters.

Station	Name	Lat	Lon	pH	T	Cond	T	Date	Time	Other Notes
D1	Dennis Creek	No Signal		8.1	12.2	275	12.2	23-Jun	1005	Same as 2007 D1
DBG	Dennis Creek Background	43.34'42.93"	123.03'49.42"	7.92	12	208	12	23-Jun	1035	Slightly farther upstream than remember 2007, road adjacent to creek
FBG	Furnace Creek Background	43.34'35.79"	123.04'07.03"	7.72	12.3	119	11.7	23-Jun	1130	In young trees above recently regraded area GPS on Jeep, not in creek
F1	Furnace Creek	43.34'43.48"	123.04'12.66"	7.21	12.7	99.5	12.9	23-Jun	1205	GPS at road, not in creek
G1	Garroutte Creek	43.35'00.92"	123.04'15.10"	7.99	14.6	112	14	23-Jun	1315	Approximately the same location as 2007
G1.5	Garroutte Creek	43.35'26.07"	123.04'08.00"	6.73	13.7	116	13.5	23-Jun	1420	Further recon shows that this is where G1.7 was marked o SAP
BR1	Big River	43.35'46.56"	123.04'04.54"	8	15.8	75.1	14.9	23-Jun	1515	~200 m E of bridge
G2	Garroutte Creek			7.75	13.3	117	13.3	23-Jun	1555	Just South of Bridge, walk across private property (nobody home
C1	Combs Creek	43.36'04.56"	123.04'26.53"	7.87	13.4	90.1	13.1	23-Jun	1620	Sample in culvert crossin road
W1	Wilson Creek	43.41'33.98"	123.03'54.81"	8.15	12	99.7	11.9	25-Jun	940	E of bridge
G0.5	Garroutte Creek	43.34'53.02"	123'04'20.40"					25-Jun	1020	Nr. Bridge at Weyco/L&T C prop line
GBG	Garroutte Background	43.34'22.47"	123'04'34.95"	7.9	12.3	111	11.6	25-Jun	1110	GPS at truck, walk in about 100M dist., 200M downstream through meanders
GBG2	Garroutte Background 2	43.34'06.21"	123.04'36.37"	7.79	13.1	103	13	25-Jun	1150	GPS at truck for GBG2 and LR1
LR1	Little River	43.34'06.21"	123.04'36.37"	7.74	12.8	120	12	25-Jun	1205	GPS at truck for GBG2 and LR2
G1.4	Garroutte	43.34'09.04"	123.04'10.11"	7.93	14.3	115	14.3	25-Jun	1335	~ location of

	Creek									G1,5 on SAP
H1	Hambolt Creek	43.36'34.26"	123.05'00.40"	7.75	16.1	73.1	14.4	25-Jun	1415	4' culvert under Weyerhauser Rd
HOB1	Hobart Creek	43.37'48.22"	123.05'17.68"	7.64	16	63.6	16.3	25-Jun	1440	4' culvert under Weyerhauser Rd
A1	Anderson Creek	43.38'02.96"	123.05'25.73"	7.25	15.3	72.5	15.9	25-Jun	1515	Walk through 72770 London Rd property with permissior
CED1	Cedar Creek			7.64	13	67.6	13	26-Jun	1100	Sample exactly at SAP locatior
J1	Johnson Creek	43.38'02.95"	123.03'25.73"	7.18	12.1	55.6	11.5	26-Jun	1125	About 10M from WeyCo Rd, poor GPS signal-may be off
CFW1	Coast Fork Willamette	43.40'15.04"	123.04'31.33"	7.67	13.5	93.8	14	26-Jun	1225	Somewhat S of location on SAP to get flow and access

Discharge calculations

Dennis Crek in culvert

Width

4 feet

Distance	0	1	2	3	4	
Represents		1	1	1		
Depth	0	0.65	0.5	0.5	0	feet
Velocity	0	0.83	0.49	0.26	0	feet/sec
Discharge		0.5395	0.245	0.13	**D1 cfs**	**0.9145**

Furnace Creek

1 min fills bucket to

4.5 gallons 7.4805 gallons/cubic foot

4.5 gpm

0.075 gps

0.0100 F1 - cfs

Garroutte Creek (at G1)

Distance	0	2	4	6	8	10	12	14	16
Represents	2	2	2	2	2	2	2	2	2
Depth	0	0.55	0.9	1.1	1.25	2.05	2.15	2.1	1
Velocity	0	0.87	1.2	1.41	1.51	1.05	1.01	0.23	0.02
Discharge	0	0.957	2.16	3.102	3.775	4.305	4.343	0.966	0.04
Total cfs	**19.6**								

Big River (at BR1)

Distance	0	1.6	4.96	8.33	11.69	15.05	18.42	21.78	25.15
Represents	0.80	2.48	3.36	3.36	3.36	3.36	3.36	3.36	3.36
Depth	0	0.6	0.4	2.8	0.8	1	1	2	3
Velocity	0	0.82	0.85	0.82	1	1.13	1.11	1.04	1.04
Discharge	0	1.221055	1.143636	7.722909	2.690909	3.800909	3.733636	6.996364	10.49455
Total cfs	**40.5**								

Garroutte Creek (at G2)

Distance	0	2.50	5.00	7.50	10.00	12.50	15.00	17.50	20
Represents	1.25	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1.25
Depth	0	0.3	0.7	1.2	2.1	2.9	1.1	0.6	0.7
Velocity	0	0.48	0.89	0.88	0.81	0.98	1.45	1.12	0
Discharge	0	0.36	1.5575	2.64	4.2525	7.105	3.9875	1.68	0
Total cfs	**21.6**								

Combs Creek (C1)

Width	2.1
Depth	0.2
Velocity	5.48
Discharge	**2.30 CFS**

Wilson Creek (W1)

Width 19 feet

Distance	0	1.50	4.25	7.00	9.75	12.50	15.25	18.00	19

Analytical Data

Station	Hg in H2O ug/l	Hg in Sed mg/kg	% Solids wt %	TSS mg/L
D1	0.01	49.6	62.1	3.64
DBG	0.00528	4.82	56.4	3.52
FBG	0.0449	2.2	63.3	14
F1	25.6	70.2	68.3	116
G1	0.00625	0.337	56.6	3.45
G1.5	0.00553	0.618	58	3.45
BR1	ND	ND	75.9	ND
G2	0.00633	0.706	67.8	3.39
C1	ND	ND	69.7	ND
W1	ND	ND	46.6	3.36
G0.5	0.00619	159	71.4	3.46
GBG	ND	1.92	46.2	3.42
GBG2	ND	ND	67.7	6.8
LR1	0.0112	0.201	62.8	3.42
G1.4	ND	1.88	62.5	3.42
H1	ND	ND	72.5	3.47
HOB1	ND	NA		3.53
A1	0.00955	ND	80.3.	13.9
CED1	ND	ND	66.3	ND
J1	ND	ND	63.5	8.13
CFW1	ND	0.302	57.8	ND
T1 (xfer at site)	ND			
T2 (xfer far from site)	ND			
F1 Dup	14.1	173	43.8	47.3
G1 Dup	0.00596	0.462	56.7	6.9

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THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
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ORELAP#: OR100021

July 03, 2008

Bryn Thoms
DEQ- EUGENE
1102 Lincoln, Suite 210
Eugene, OR 97401

RE: Black Butte Mine

Enclosed are the results of analyses for samples received by the laboratory on 06/25/08 07:15. The following list is a summary of the Work Orders contained in this report, generated on 07/03/08 13:18.

If you have any questions concerning this report, please feel free to contact me.

Work Order	Project	ProjectNumber
PRF0877	Black Butte Mine	07-63680-35754-34777

Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
D1- Water	PRF0877-01	Water	06/23/08 10:05	06/25/08 07:15
D1- Sediment	PRF0877-02	Soil	06/23/08 10:05	06/25/08 07:15
DBG- Water	PRF0877-03	Water	06/23/08 10:35	06/25/08 07:15
DBG- Sediment	PRF0877-04	Soil	06/23/08 10:05	06/25/08 07:15
FBG- Water	PRF0877-05	Water	06/23/08 11:30	06/25/08 07:15
FBG- Sediment	PRF0877-06	Soil	06/23/08 11:30	06/25/08 07:15
TB1	PRF0877-07	Water	06/23/08 11:50	06/25/08 07:15
F1- Water	PRF0877-08	Water	06/23/08 12:00	06/25/08 07:15
F1- Sediment	PRF0877-09	Soil	06/23/08 12:00	06/25/08 07:15
F1D- Water	PRF0877-10	Water	06/23/08 12:05	06/25/08 07:15
F1D- Sediment	PRF0877-11	Soil	06/23/08 12:05	06/25/08 07:15
G1- Water	PRF0877-12	Water	06/23/08 13:15	06/25/08 07:15
G1- Sediment	PRF0877-13	Soil	06/23/08 13:15	06/25/08 07:15
G1D- Water	PRF0877-14	Water	06/23/08 13:40	06/25/08 07:15
G1D- Sediment	PRF0877-15	Soil	06/23/08 13:40	06/25/08 07:15
G1.5- Water	PRF0877-16	Water	06/23/08 14:20	06/25/08 07:15
G1.5- Sediment	PRF0877-17	Soil	06/23/08 14:20	06/25/08 07:15
BR1- Water	PRF0877-18	Water	06/23/08 15:15	06/25/08 07:15
BR1- Sediment	PRF0877-19	Soil	06/23/08 15:15	06/25/08 07:15
G2- Water	PRF0877-20	Water	06/23/08 15:55	06/25/08 07:15
G2- Sediment	PRF0877-21	Soil	06/23/08 15:55	06/25/08 07:15
C1- Water	PRF0877-22	Water	06/23/08 16:20	06/25/08 07:15
C1- Sediment	PRF0877-23	Soil	06/23/08 16:20	06/25/08 07:15

Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE
1102 Lincoln, Suite 210
Eugene, OR 97401

Project Name: **Black Butte Mine**
Project Number: 07-63680-35754-34777
Project Manager: Bryn Thoms

Report Created: 07/03/08 13:18

Mercury per EPA Method 1631E

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0877-01 (D1- Water)				**Water**			**Sampled: 06/23/08 10:05**			
Mercury	EPA 1631E	**0.0100**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 09:54	
PRF0877-03 (DBG- Water)				**Water**			**Sampled: 06/23/08 10:35**			
Mercury	EPA 1631E	**0.00528**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 09:56	
PRF0877-05 (FBG- Water)				**Water**			**Sampled: 06/23/08 11:30**			
Mercury	EPA 1631E	**0.0449**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:05	
PRF0877-07 (TB1)				**Water**			**Sampled: 06/23/08 11:50**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:08	
PRF0877-08 (F1- Water)				**Water**			**Sampled: 06/23/08 12:00**			
Mercury	EPA 1631E	**25.6**	----	2.50	ug/l	500x	8060967	06/25/08 15:23	06/26/08 11:10	
PRF0877-10 (F1D- Water)				**Water**			**Sampled: 06/23/08 12:05**			
Mercury	EPA 1631E	**14.1**	----	1.00	ug/l	200x	8060967	06/25/08 15:23	06/26/08 11:06	
PRF0877-12 (G1- Water)				**Water**			**Sampled: 06/23/08 13:15**			
Mercury	EPA 1631E	**0.00625**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:29	
PRF0877-14 (G1D- Water)				**Water**			**Sampled: 06/23/08 13:40**			
Mercury	EPA 1631E	**0.00596**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:31	
PRF0877-16 (G1.5- Water)				**Water**			**Sampled: 06/23/08 14:20**			
Mercury	EPA 1631E	**0.00553**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:34	
PRF0877-18 (BR1- Water)				**Water**			**Sampled: 06/23/08 15:15**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:37	
PRF0877-20 (G2- Water)				**Water**			**Sampled: 06/23/08 15:55**			
Mercury	EPA 1631E	**0.00633**	----	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:39	

Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Mercury per EPA Method 1631E

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0877-22 (C1- Water)			**Water**			**Sampled: 06/23/08 16:20**				
Mercury	EPA 1631E	ND	——	0.00500	ug/l	1x	8060967	06/25/08 15:23	06/26/08 10:42	

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Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Total Mercury per EPA Method 7471A

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0877-02 (D1- Sediment)			**Soil**			**Sampled: 06/23/08 10:05**				
Mercury	EPA 7471A	**49.4**	----	4.96	mg/kg dry	50x	8060944	06/25/08 10:37	06/25/08 18:09	
PRF0877-04 (DBG- Sediment)			**Soil**			**Sampled: 06/23/08 10:05**				
Mercury	EPA 7471A	**4.82**	----	1.57	mg/kg dry	10x	8060944	06/25/08 10:37	06/25/08 18:01	
PRF0877-06 (FBG- Sediment)			**Soil**			**Sampled: 06/23/08 11:30**				
Mercury	EPA 7471A	**2.20**	----	0.209	mg/kg dry	2x	8060944	06/25/08 10:37	06/25/08 17:32	
PRF0877-09 (F1- Sediment)			**Soil**			**Sampled: 06/23/08 12:00**				
Mercury	EPA 7471A	**70.2**	----	5.92	mg/kg dry	50x	8060944	06/25/08 10:37	06/25/08 17:36	
PRF0877-11 (F1D- Sediment)			**Soil**			**Sampled: 06/23/08 12:05**				
Mercury	EPA 7471A	**173**	----	14.7	mg/kg dry	100x	8060944	06/25/08 10:37	06/25/08 17:43	
PRF0877-13 (G1- Sediment)			**Soil**			**Sampled: 06/23/08 13:15**				
Mercury	EPA 7471A	**0.337**	----	0.154	mg/kg dry	1x	8060944	06/25/08 10:37	06/25/08 17:46	
PRF0877-15 (G1D- Sediment)			**Soil**			**Sampled: 06/23/08 13:40**				
Mercury	EPA 7471A	**0.462**	----	0.110	mg/kg dry	1x	8060944	06/25/08 10:37	06/25/08 17:48	
PRF0877-17 (G1.5- Sediment)			**Soil**			**Sampled: 06/23/08 14:20**				
Mercury	EPA 7471A	**0.618**	----	0.139	mg/kg dry	1x	8060944	06/25/08 10:37	06/25/08 17:51	
PRF0877-19 (BR1- Sediment)			**Soil**			**Sampled: 06/23/08 15:15**				
Mercury	EPA 7471A	ND	----	0.0941	mg/kg dry	1x	8060944	06/25/08 10:37	06/25/08 17:53	
PRF0877-21 (G2- Sediment)			**Soil**			**Sampled: 06/23/08 15:55**				
Mercury	EPA 7471A	**0.706**	----	0.0884	mg/kg dry	1x	8060944	06/25/08 10:37	06/25/08 17:55	
PRF0877-23 (C1- Sediment)			**Soil**			**Sampled: 06/23/08 16:20**				
Mercury	EPA 7471A	ND	----	0.0804	mg/kg dry	1x	8060944	06/25/08 10:37	06/25/08 17:59	

Richard D. Reid For Darrell Auvil, Project Manager

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ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Conventional Chemistry Parameters per Standard Methods

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0877-01 (D1- Water)			**Water**			**Sampled: 06/23/08 10:05**				
Total Suspended Solids	SM 2540D	**3.64**	----	3.64	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-03 (DBG- Water)			**Water**			**Sampled: 06/23/08 10:35**				
Total Suspended Solids	SM 2540D	**3.52**	----	3.52	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-05 (FBG- Water)			**Water**			**Sampled: 06/23/08 11:30**				
Total Suspended Solids	SM 2540D	**14.0**	----	3.51	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-08 (F1- Water)			**Water**			**Sampled: 06/23/08 12:00**				
Total Suspended Solids	SM 2540D	**116**	----	3.51	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-10 (F1D- Water)			**Water**			**Sampled: 06/23/08 12:05**				
Total Suspended Solids	SM 2540D	**47.3**	----	3.64	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-12 (G1- Water)			**Water**			**Sampled: 06/23/08 13:15**				
Total Suspended Solids	SM 2540D	**3.45**	----	3.45	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-14 (G1D- Water)			**Water**			**Sampled: 06/23/08 13:40**				
Total Suspended Solids	SM 2540D	**6.90**	----	3.45	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-16 (G1.5- Water)			**Water**			**Sampled: 06/23/08 14:20**				
Total Suspended Solids	SM 2540D	**3.45**	----	3.45	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-18 (BR1- Water)			**Water**			**Sampled: 06/23/08 15:15**				
Total Suspended Solids	SM 2540D	ND	----	3.45	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-20 (G2- Water)			**Water**			**Sampled: 06/23/08 15:55**				
Total Suspended Solids	SM 2540D	**3.39**	----	3.39	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	
PRF0877-22 (C1- Water)			**Water**			**Sampled: 06/23/08 16:20**				
Total Suspended Solids	SM 2540D	ND	----	3.51	mg/l	1x	8060954	06/25/08 11:50	06/25/08 16:55	

TestAmerica Portland

Richard D. Reid For Darrell Auvil, Project Manager

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THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Percent Dry Weight (Solids) per Standard Methods

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0877-02 (D1- Sediment)			**Soil**			**Sampled: 06/23/08 10:05**				
% Solids	NCA SOP	62.1	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-04 (DBG- Sediment)			**Soil**			**Sampled: 06/23/08 10:05**				
% Solids	NCA SOP	56.4	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-06 (FBG- Sediment)			**Soil**			**Sampled: 06/23/08 11:30**				
% Solids	NCA SOP	63.3	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-09 (F1- Sediment)			**Soil**			**Sampled: 06/23/08 12:00**				
% Solids	NCA SOP	68.3	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-11 (F1D- Sediment)			**Soil**			**Sampled: 06/23/08 12:05**				
% Solids	NCA SOP	43.8	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-13 (G1- Sediment)			**Soil**			**Sampled: 06/23/08 13:15**				
% Solids	NCA SOP	56.6	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-15 (G1D- Sediment)			**Soil**			**Sampled: 06/23/08 13:40**				
% Solids	NCA SOP	56.7	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-17 (G1.5- Sediment)			**Soil**			**Sampled: 06/23/08 14:20**				
% Solids	NCA SOP	58.0	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-19 (BR1- Sediment)			**Soil**			**Sampled: 06/23/08 15:15**				
% Solids	NCA SOP	75.9	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-21 (G2- Sediment)			**Soil**			**Sampled: 06/23/08 15:55**				
% Solids	NCA SOP	67.8	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	
PRF0877-23 (C1- Sediment)			**Soil**			**Sampled: 06/23/08 16:20**				

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report shall not be reproduced except in full, without the written approval of the laboratory.

Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE	*Project Name:*	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Percent Dry Weight (Solids) per Standard Methods

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0877-23 (C1- Sediment)			**Soil**			**Sampled: 06/23/08 16:20**				
% Solids	NCA SOP	**69.7**	—	0.0100	% by Weight	1x	8061121	06/30/08 11:41	06/30/08 11:41	

Richard D. Reid For Darrell Auvil, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
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ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	*Bryn Thoms*	07/03/08 13:18

Mercury per EPA Method 1631E - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8060967 **Water Preparation Method: EPA 1631**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8060967-BLK1)								**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	ND	---	0.00500	ug/l	1x	--	--	--	--	--	--	06/26/08 09:28	
LCS (8060967-BS1)								**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0472	---	0.00500	ug/l	1x	--	0.0500	94.3%	(85-115)	--	--	06/26/08 09:31	
LCS Dup (8060967-BSD1)								**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0461	---	0.00500	ug/l	1x	--	0.0500	92.2%	(85-115)	2.23%	(20)	06/26/08 09:35	
Duplicate (8060967-DUP1)					**QC Source: PRF0877-01**			**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0106	---	0.00500	ug/l	1x	0.0100	--	--	--	5.26%	(20)	06/26/08 09:38	
Matrix Spike (8060967-MS1)					**QC Source: PRF0877-01**			**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0578	---	0.00500	ug/l	1x	0.0100	0.0500	95.5%	(71-125)	--	--	06/26/08 09:41	
Matrix Spike (8060967-MS2)					**QC Source: PRF0877-20**			**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0506	---	0.00500	ug/l	1x	0.00633	0.0500	88.6%	(71-125)	--	--	06/26/08 09:47	
Matrix Spike Dup (8060967-MSD1)					**QC Source: PRF0877-01**			**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0595	---	0.00500	ug/l	1x	0.0100	0.0500	99.0%	(71-125)	2.96%	(20)	06/26/08 09:44	
Matrix Spike Dup (8060967-MSD2)					**QC Source: PRF0877-20**			**Extracted: 06/25/08 15:23**						
Mercury	EPA 1631E	0.0508	---	0.00500	ug/l	1x	0.00633	0.0500	88.9%	(71-125)	0.340%	(20)	06/26/08 09:50	

Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Total Mercury per EPA Method 7471A - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8060944 **Soil Preparation Method: EPA 7471A**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8060944-BLK1)								Extracted: 06/25/08 10:37						
Mercury	EPA 7471A	ND	---	0.100	mg/kg wet	1x	--	--	--	--	--	--	06/25/08 16:52	
LCS (8060944-BS1)								Extracted: 06/25/08 10:37						
Mercury	EPA 7471A	0.974	---	0.100	mg/kg wet	1x	--	1.00	97.4%	(80-120)	--	--	06/25/08 16:54	
LCS Dup (8060944-BSD1)								Extracted: 06/25/08 10:37						
Mercury	EPA 7471A	0.987	---	0.100	mg/kg wet	1x	--	1.00	98.7%	(80-120)	1.37%	(20)	06/25/08 16:58	
Duplicate (8060944-DUP1)				QC Source: PRF0772-01				Extracted: 06/25/08 10:37						
Mercury	EPA 7471A	ND	---	0.0852	mg/kg dry	1x	ND	--	--	--	NR	(40)	06/25/08 17:02	
Matrix Spike (8060944-MS1)				QC Source: PRF0772-01				Extracted: 06/25/08 10:37						
Mercury	EPA 7471A	0.783	---	0.0789	mg/kg dry	1x	ND	0.789	99.2%	(75-125)	--	--	06/25/08 17:04	
Matrix Spike Dup (8060944-MSD1)				QC Source: PRF0772-01				Extracted: 06/25/08 10:37						
Mercury	EPA 7471A	0.798	---	0.0798	mg/kg dry	1x	ND	0.798	99.9%	(75-125)	1.91%	(40)	06/25/08 17:07	

Richard D. Reid For Darrell Auvil, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Conventional Chemistry Parameters per Standard Methods - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8060954 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8060954-BLK1)								**Extracted: 06/25/08 11:50**						
Total Suspended Solids	SM 2540D	ND	—	10.0	mg/l	1x	–	–	–	–	–	–	06/25/08 16:55	
LCS (8060954-BS1)								**Extracted: 06/25/08 11:50**						
Total Suspended Solids	SM 2540D	50.0	—	10.0	mg/l	1x	–	50.0	100%	(80-120)	–	–	06/25/08 16:55	
Duplicate (8060954-DUP1)					**QC Source: PRF0848-01**			**Extracted: 06/25/08 11:50**						
Total Suspended Solids	SM 2540D	8.70	—	8.70	mg/l	1x	8.70	–	–	–	0.00%	(20)	06/25/08 16:55	

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Richard D. Reid For Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Percent Dry Weight (Solids) per Standard Methods - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8061121 **Other dry Preparation Method: Dry Weight**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (8061121-DUP1)					QC Source: PRF0852-01				Extracted: 06/30/08 11:41					
% Solids	NCA SOP	72.0	--	0.0100	% by Weight	1x	69.7	--	--	--	3.25%	(20)	06/30/08 11:41	

TestAmerica Portland

Richard D. Reid For Darrell Auvil, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	07-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/03/08 13:18

Notes and Definitions

Report Specific Notes:

None

Laboratory Reporting Conventions:

DET	-	Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.
ND	-	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR/NA	-	Not Reported / Not Available
dry	-	Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.
wet	-	Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis.
RPD	-	RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).
MRL	-	METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.
MDL*	-	METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.
Dil	-	Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.
Reporting Limits	-	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.
Electronic Signature	-	Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy.* Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Richard D. Reid For Darrell Auvil, Project Manager

0033

TestAmerica
ANALYTICAL TESTING CORPORATION

11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave, Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210
2000 W. International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #: PRF 0877

CLIENT: DEQ

REPORT TO: Brian Thomas
ADDRESS: 1102 Lincoln St
Eugene OR 97401
PHONE: 541 687 7424 FAX: 541 686 7551

INVOICE TO: SAME

P.O. NUMBER: 125 777

PROJECT NAME: Black Butte Mine
PROJECT NUMBER: 09-63160-~~34771~~ 35754 -34777
SAMPLED BY: S. Wifley

PRESERVATIVE: HCL

TURNAROUND REQUEST In Business Days *
Organic & Inorganic Analyses: 10 (STD.) 7 5 4 3 2 1 <1
Petroleum Hydrocarbon Analyses: 5 (STD.) 4 3 2 1 <1
OTHER Specify: Per Contract
* Turnaround Requests less than standard may incur Rush Charges.

REQUESTED ANALYSES

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	1631 Hg in H_2O	160.2 TSS	7471A Hg										MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	TA WO ID
1	D1	6/23/08 10:05	✓	✓	✓										W/S	3		
2	DBG	6/23/08 1035	✓	✓	✓										W/S	3		
3	FBG	6/23/08 1130	✓	✓	✓										W/S	3		
4	TB1	6/23/08 1150	✓												W	1		
5	F1	6/23/08 1200	✓	✓	✓										W/S	3		
6	F1D	6/23/08 1205	✓	✓	✓										W/S	3		
7	G1	6/23/08 1315	✓	✓	✓										W/S	3		
8	G1D	6/23/08 1340	✓	✓	✓										W/S	3		
9	G1.5	6/23/08 1420	✓	✓	✓										W/S	3		
10	BR1	6/23/08 1515	✓	✓	✓										W/S	3		

RELEASED BY: [signature] PRINT NAME: SETH SADOFSKY FIRM: DEQ DATE: 6/24/08 TIME: 10:30
RECEIVED BY: Brianna Earley PRINT NAME: Brianna Earley FIRM: TAP DATE: 6/25/08 TIME: 0715
RELEASED BY: PRINT NAME: FIRM: DATE: TIME:
RECEIVED BY: PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS:

TEMP: 5.4°C PAGE 1 OF 2

COC REV 09/2004

TestAmerica
ANALYTICAL TESTING CORPORATION

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11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave, Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563 9210

CHAIN OF CUSTODY REPORT

Work Order #: PRF0877

CLIENT: DEQ

INVOICE TO: SAME

REPORT TO: Bryn Thoms
ADDRESS: 1102 Lincoln St.
Eugene OR 97401
PHONE: 541 686-7424 FAX: 541 686-7551

P.O. NUMBER: 123737

PROJECT NAME: Black Butte Ranch
PROJECT NUMBER: 04-13680-35754-34777
SAMPLED BY: SHADOSS

TURNAROUND REQUEST
*In Business Days **
Organic & Inorganic Analyses: 10 STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1
Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1
OTHER Specify: Per Client
* Turnaround Requests less than standard may incur Rush Charges

PRESERVATIVE: HCl

REQUESTED ANALYSES: 1631 Hg | 160.2 TSS | 7471A Hg

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	1631 Hg	160.2 TSS	7471A Hg	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	TA WO ID
1	G2	6/23/08 1555	✓	✓	✓	W/S	3		
2	C1	6/23/08 1620	✓	✓	✓	W/S	3		
3									
4									
5									
6									
7									
8									
9									
10									

RELEASED BY: [signature] DATE: 6/24/08
PRINT NAME: SETH SHADOSS FIRM: DEQ TIME: 10:20

RECEIVED BY: Brianna Eatley DATE: 6/25/08
PRINT NAME: Brianna Eatley FIRM: TAP TIME: 0715

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:

TEMP: 5.4°C PAGE 2 OF 2

COC REV 09 2004

0034

TestAmerica Sample Receipt Checklist

Cooler ID(s):

Received by: (section A)
Date: 6/25/08
Time: 0715
Initials: BJE

Unpacked by: (section B)
Date: 6/25/08
Initials: BJE

Logged-in by:
Date: 6/25/08
Initials: BJE

Work Order No. PRF0877
Client: DEQ-Eugene
Project: Black Butte Mine

Temperature out of range:
___Not enough Ice
___No Ice
___Ice Melted
___Within 4 Hours
___Other:

***ESI Clients (see Section C)

Cooler Temperature (IR): 5.4 °C plastic (glass) NA (oil/air OR ESI client) Temperature Blank: _____ °C DIGI #1 #2

A

Custody Seals: (#1)
Signature: (Y) N Dated: 6/24/08
___None

Container Type:
1 #Cooler(s)
___#Box(s)
___None (___#Other:_____)

Coolant Type:
___Gel/ Blue Ice
X Loose Ice
___None

Packing Material:
X Bubble Bags
___Styrofoam Cubbies
___Peanuts
___None (___Other:_____)

Received from:
___TA Courier
___Senvoy
X UPS
___Fed Ex
___Client
___TDP
___USPS
___SDS
___Mid-Valley
___GS/TA
___GS/Senvoy
___Other:
_____

0035

B

Sample Status:
(If N circled, see NOD)

General:
Intact? (Y) N
Containers Match COC? (Y) N none given
IDs Match COC? (Y) N

For Analyses Requested:
Cyanide checked? Y N (NA)
Correct Type & Preservation? (Y) N
Adequate Volume? (Y) N
Within Hold Time? (Y) N

Volatiles/ Oil Quality:
VOAs/ Syringes free of Headspace? Y N (NA)
TB on COC? not provided Y N (NA)

Metals:
HNO3 Preserved? Y N (NA)
Dissolved Metals Filtered? Y N (NA)

C

***ESI Clients Only:

Temperature Blank: _____ °C not provided DIGI #1 #2

All preserved bottles checked Y N NA (voas/soils/all unp.)
All preserved accordingly? Y N (see NOD) NA (voas/soils/all unp.)

FED EX/UPS: Was the tracking paper keepable? (YES) NO

If circled NO, what is the Tracking number? _____

FED EX Goldstreak UPS DHL Other: _____

Project Managers:

Comments: _____

PM Reviewed: (Initial/Date)

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210
ORELAP#: OR100021

July 14, 2008

Bryn Thoms
DEQ- EUGENE
1102 Lincoln, Suite 210
Eugene, OR 97401

RE: Black Butte Mine

Enclosed are the results of analyses for samples received by the laboratory on 06/27/08 07:30. The following list is a summary of the Work Orders contained in this report, generated on 07/14/08 14:04.

If you have any questions concerning this report, please feel free to contact me.

Work Order	Project	ProjectNumber
PRF0966	Black Butte Mine	09-63680-35754-34777

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Darrell W. Auvil

Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
W1- Water	PRF0966-01	Water	06/25/08 09:40	06/27/08 07:30
W1- Soil	PRF0966-02	Soil	06/25/08 09:40	06/27/08 07:30
TB2	PRF0966-03	Water	06/25/08 00:00	06/27/08 07:30
GO.5- Water	PRF0966-04	Water	06/25/08 10:20	06/27/08 07:30
GO.5- Soil	PRF0966-05	Soil	06/25/08 10:20	06/27/08 07:30
GBG- Water	PRF0966-06	Water	06/25/08 11:10	06/27/08 07:30
GBG- Soil	PRF0966-07	Soil	06/25/08 11:10	06/27/08 07:30
GBG2- Water	PRF0966-08	Water	06/25/08 11:50	06/27/08 07:30
GBG2- Soil	PRF0966-09	Soil	06/25/08 11:50	06/27/08 07:30
LR1- Water	PRF0966-10	Water	06/25/08 12:05	06/27/08 07:30
LR1- Soil	PRF0966-11	Soil	06/25/08 12:05	06/27/08 07:30
G1.4- Water	PRF0966-12	Water	06/25/08 13:35	06/27/08 07:30
G1.4- Soil	PRF0966-13	Soil	06/25/08 13:35	06/27/08 07:30
H1- Water	PRF0966-14	Water	06/25/08 14:15	06/27/08 07:30
H1- Soil	PRF0966-15	Soil	06/25/08 14:15	06/27/08 07:30
HUB1- Water	PRF0966-16	Water	06/25/08 14:40	06/27/08 07:30
A1- Water	PRF0966-17	Water	06/25/08 15:15	06/27/08 07:30
A1- Soil	PRF0966-18	Soil	06/25/08 15:15	06/27/08 07:30

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Mercury per EPA Method 1631E

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0966-01 (W1- Water)				**Water**			**Sampled: 06/25/08 09:40**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:01	
PRF0966-03 (TB2)				**Water**			**Sampled: 06/25/08 00:00**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:14	
PRF0966-04 (GO.5- Water)				**Water**			**Sampled: 06/25/08 10:20**			
Mercury	EPA 1631E	**0.00619**	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:17	
PRF0966-06 (GBG- Water)				**Water**			**Sampled: 06/25/08 11:10**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:19	
PRF0966-08 (GBG2- Water)				**Water**			**Sampled: 06/25/08 11:50**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:22	
PRF0966-10 (LR1- Water)				**Water**			**Sampled: 06/25/08 12:05**			
Mercury	EPA 1631E	**0.0112**	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:25	
PRF0966-12 (G1.4- Water)				**Water**			**Sampled: 06/25/08 13:35**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:27	
PRF0966-14 (H1- Water)				**Water**			**Sampled: 06/25/08 14:15**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:30	
PRF0966-16 (HUB1- Water)				**Water**			**Sampled: 06/25/08 14:40**			
Mercury	EPA 1631E	ND	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:33	
PRF0966-17 (A1- Water)				**Water**			**Sampled: 06/25/08 15:15**			
Mercury	EPA 1631E	**0.00955**	----	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:35	

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Darrell Auvil, Project Manager

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Total Mercury per EPA Method 7471A

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0966-02 (W1- Soil)			**Soil**			**Sampled: 06/25/08 09:40**				
Mercury	EPA 7471A	ND	—	0.176	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 14:46	
PRF0966-05 (GO.5- Soil)			**Soil**			**Sampled: 06/25/08 10:20**				
Mercury	EPA 7471A	**159**	—	13.9	mg/kg dry	100x	8070024	07/01/08 10:37	07/01/08 15:38	
PRF0966-07 (GBG- Soil)			**Soil**			**Sampled: 06/25/08 11:10**				
Mercury	EPA 7471A	**1.92**	—	0.174	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 15:01	
PRF0966-09 (GBG2- Soil)			**Soil**			**Sampled: 06/25/08 11:50**				
Mercury	EPA 7471A	ND	—	0.138	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 15:05	
PRF0966-11 (LR1- Soil)			**Soil**			**Sampled: 06/25/08 12:05**				
Mercury	EPA 7471A	**0.201**	—	0.106	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 15:13	
PRF0966-13 (G1.4- Soil)			**Soil**			**Sampled: 06/25/08 13:35**				
Mercury	EPA 7471A	**1.88**	—	0.105	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 15:15	
PRF0966-15 (H1- Soil)			**Soil**			**Sampled: 06/25/08 14:15**				
Mercury	EPA 7471A	ND	—	0.119	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 15:19	
PRF0966-18 (A1- Soil)			**Soil**			**Sampled: 06/25/08 15:15**				
Mercury	EPA 7471A	ND	—	0.0747	mg/kg dry	1x	8070024	07/01/08 10:37	07/01/08 15:21	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Conventional Chemistry Parameters per Standard Methods

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0966-01 (W1- Water)			**Water**			**Sampled: 06/25/08 09:40**				
Total Suspended Solids	SM 2540D	**3.36**	----	3.36	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-04 (GO.5- Water)			**Water**			**Sampled: 06/25/08 10:20**				
Total Suspended Solids	SM 2540D	**3.46**	----	3.46	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-06 (GBG- Water)			**Water**			**Sampled: 06/25/08 11:10**				
Total Suspended Solids	SM 2540D	**3.42**	----	3.42	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-08 (GBG2- Water)			**Water**			**Sampled: 06/25/08 11:50**				
Total Suspended Solids	SM 2540D	**6.80**	----	3.40	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-10 (LR1- Water)			**Water**			**Sampled: 06/25/08 12:05**				
Total Suspended Solids	SM 2540D	**3.42**	----	3.42	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-12 (G1.4- Water)			**Water**			**Sampled: 06/25/08 13:35**				
Total Suspended Solids	SM 2540D	**3.42**	----	3.42	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-14 (H1- Water)			**Water**			**Sampled: 06/25/08 14:15**				
Total Suspended Solids	SM 2540D	**3.47**	----	3.47	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-16 (HUB1- Water)			**Water**			**Sampled: 06/25/08 14:40**				
Total Suspended Solids	SM 2540D	**3.53**	----	3.53	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	
PRF0966-17 (A1- Water)			**Water**			**Sampled: 06/25/08 15:15**				
Total Suspended Solids	SM 2540D	**13.9**	----	3.47	mg/l	1x	8061117	06/30/08 10:30	06/30/08 17:46	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Percent Dry Weight (Solids) per Standard Methods

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Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF0966-02 (W1- Soil)			**Soil**			**Sampled: 06/25/08 09:40**				
% Solids	NCA SOP	46.6	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-05 (GO.5- Soil)			**Soil**			**Sampled: 06/25/08 10:20**				
% Solids	NCA SOP	71.4	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-07 (GBG- Soil)			**Soil**			**Sampled: 06/25/08 11:10**				
% Solids	NCA SOP	46.2	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-09 (GBG2- Soil)			**Soil**			**Sampled: 06/25/08 11:50**				
% Solids	NCA SOP	67.7	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-11 (LR1- Soil)			**Soil**			**Sampled: 06/25/08 12:05**				
% Solids	NCA SOP	62.8	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-13 (G1.4- Soil)			**Soil**			**Sampled: 06/25/08 13:35**				
% Solids	NCA SOP	62.5	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-15 (H1- Soil)			**Soil**			**Sampled: 06/25/08 14:15**				
% Solids	NCA SOP	75.5	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	
PRF0966-18 (A1- Soil)			**Soil**			**Sampled: 06/25/08 15:15**				
% Solids	NCA SOP	80.3	----	0.0100	% by Weight	1x	8070090	07/02/08 15:41	07/02/08 15:41	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Mercury per EPA Method 1631E - Laboratory Quality Control Results

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QC Batch: 8061139 **Water Preparation Method: EPA 1631**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8061139-BLK1)								Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	ND	--	0.00500	ug/l	1x	--	--	--	--	--	--	07/01/08 09:33	
LCS (8061139-BS1)								Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0488	--	0.00500	ug/l	1x	--	0.0500	97.5%	(85-115)	--	--	07/01/08 09:35	
LCS Dup (8061139-BSD1)								Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0491	--	0.00500	ug/l	1x	--	0.0500	98.3%	(85-115)	0.735%	(20)	07/01/08 09:39	
Duplicate (8061139-DUP1)				QC Source: PRF0966-01				Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	ND	--	0.00500	ug/l	1x	ND	--	--	--	NR	(20)	07/01/08 09:42	
Matrix Spike (8061139-MS1)				QC Source: PRF0966-01				Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0473	--	0.00500	ug/l	1x	0.000671	0.0500	93.3%	(71-125)	--	--	07/01/08 09:45	
Matrix Spike (8061139-MS2)				QC Source: PRF0966-17				Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0573	--	0.00500	ug/l	1x	0.00955	0.0500	95.4%	(71-125)	--	--	07/01/08 09:51	
Matrix Spike Dup (8061139-MSD1)				QC Source: PRF0966-01				Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0491	--	0.00500	ug/l	1x	0.000671	0.0500	96.8%	(71-125)	3.64%	(20)	07/01/08 09:48	
Matrix Spike Dup (8061139-MSD2)				QC Source: PRF0966-17				Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0576	--	0.00500	ug/l	1x	0.00955	0.0500	96.0%	(71-125)	0.521%	(20)	07/01/08 09:55	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Total Mercury per EPA Method 7471A - Laboratory Quality Control Results

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QC Batch: 8070024 **Soil Preparation Method: EPA 7471A**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8070024-BLK1)								Extracted: 07/01/08 10:37						
Mercury	EPA 7471A	ND	—	0.100	mg/kg wet	1x	--	--	--	--	--	--	07/01/08 13:58	
LCS (8070024-BS1)								Extracted: 07/01/08 10:37						
Mercury	EPA 7471A	1.01	—	0.100	mg/kg wet	1x	--	1.00	101%	(80-120)	--	--	07/01/08 14:00	
LCS Dup (8070024-BSD1)								Extracted: 07/01/08 10:37						
Mercury	EPA 7471A	0.998	—	0.100	mg/kg wet	1x	--	1.00	99.8%	(80-120)	1.29%	(20)	07/01/08 14:04	
Duplicate (8070024-DUP1)				QC Source: PRF0961-01				Extracted: 07/01/08 10:37						
Mercury	EPA 7471A	ND	—	0.267	mg/kg dry	1x	ND	--	--	--	NR	(40)	07/01/08 14:08	
Matrix Spike (8070024-MS1)				QC Source: PRF0961-01				Extracted: 07/01/08 10:37						
Mercury	EPA 7471A	3.00	—	0.287	mg/kg dry	1x	ND	2.87	104%	(75-125)	--	--	07/01/08 14:10	
Matrix Spike Dup (8070024-MSD1)				QC Source: PRF0961-01				Extracted: 07/01/08 10:37						
Mercury	EPA 7471A	3.38	—	0.318	mg/kg dry	1x	ND	3.18	106%	(75-125)	11.8%	(40)	07/01/08 14:13	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Conventional Chemistry Parameters per Standard Methods - Laboratory Quality Control Results

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QC Batch: 8061117 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8061117-BLK1)								Extracted: 06/30/08 10:30						
Total Suspended Solids	SM 2540D	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	06/30/08 17:46	
LCS (8061117-BS1)								Extracted: 06/30/08 10:30						
Total Suspended Solids	SM 2540D	50.0	---	10.0	mg/l	1x	--	50.0	100%	(80-120)	--	--	06/30/08 17:46	
Duplicate (8061117-DUP1)					QC Source: PRF0930-02			Extracted: 06/30/08 10:30						
Total Suspended Solids	SM 2540D	ND	---	2.00	mg/l	1x	ND	--	--	--	NR	(20)	06/30/08 17:46	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Percent Dry Weight (Solids) per Standard Methods - Laboratory Quality Control Results

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QC Batch: 8070090 **Other dry Preparation Method: Dry Weight**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (8070090-DUP1)					QC Source: PRG0072-01				Extracted: 07/02/08 15:41					
% Solids	NCA SOP	91.4	—	0.0100	% by Weight	1x	79.5	--	--	--	13.9%	(20)	07/02/08 15:41	

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DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-35754-34777	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 14:04

Notes and Definitions

Report Specific Notes:

None

Laboratory Reporting Conventions:

DET	-	Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.
ND	-	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR/NA	-	Not Reported / Not Available
dry	-	Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.
wet	-	Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis.
RPD	-	RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).
MRL	-	METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.
MDL*	-	METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.
Dil	-	Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.
Reporting Limits	-	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.
Electronic Signature	-	Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy*. Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

CHAIN OF CUSTODY REPORT

Work Order #: PRF0966

CLIENT: DEQ

REPORT TO: Bryn Thoms
ADDRESS: 1102 Lincoln St, Suite 210
Eugene OR 97401

PHONE: 541 687 7424 FAX: 541 686 7551

INVOICE TO: Same

P.O. NUMBER: 25977

PROJECT NAME: Black Butte Mine

PROJECT NUMBER: 09-63680-35754-3477R

SAMPLED BY: Sedlosky

PRESERVATIVE: HCL

REQUESTED ANALYSES

TURNAROUND REQUEST in Business Days*

OTHER Specify: Per Contract

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	1631 Hg	160.2 TSS	7471A Hg	MATRIX (W, S, O)	# OF CONT.	LOCATION COMMENTS	TA WO ID
1. W1	6/25/08 940	✓	✓	✓	W/S	3		
2. TB2	6/25/08 950	✓			W	1		
3. G0.5	6/25/08 1020	✓	✓	✓	W/S	3		
4. GBG	6/25/08 1110	✓	✓	✓	W/S	3		
5. GBG2	6/25/08 1150	✓	✓	✓	W/S	3		
6. LR1	6/25/08 1205	✓	✓	✓	W/S	3		
7. G1.4	6/25/08 1335	✓	✓	✓	W/S	3		
8. H1	6/25/08 1415	✓	✓	✓	W/S	3		
9. HOB1	6/25/08 1440	✓	✓	✓	W/S	3		
10. A1	6/25/08 1515	✓	✓		W	2		

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: Brianna Eaty DATE: 6/27/08
PRINT NAME: Brianna Eaty FIRM: TAP TIME: 0730

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:

TEMP:

PAGE OF

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11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave, Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

TestAmerica
ANALYTICAL TESTING CORPORATION

CHAIN OF CUSTODY REPORT

Work Order #: PRF0966

CLIENT: DEQ
REPORT TO: Bryn Thoms
ADDRESS: 1102 Lincoln St. Suite 210, Eugene OR 97401
PHONE: 541 687 7424 FAX: 541 686 7551
INVOICE TO: Same
P.O. NUMBER: 65777
PROJECT NAME: Black Butte Mine
PROJECT NUMBER: 09-63680-35754-34772
SAMPLED BY: Sadotsky

PRESERVATIVE: HCL

TURNAROUND REQUEST in Business Days *
Organic & Inorganic Analyses: 10 (STD) 7 5 4 3 2 1 <1
Petroleum Hydrocarbon Analyses: 5 (STD) 4 3 2 1 <1
OTHER (circled) Specify: Per Contract
* Turnaround Requests less than standard may incur Rush Charges.

REQUESTED ANALYSES

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	1631 Hg	160.2 TSS	7471A Hg	MATRIX (W, S, O)	# OF CONT.	LOCATION / COMMENTS	TA WO ID
1	W1	6/25/08 940	✓	✓	✓	W/S	3		
2	TB2	6/25/08 950	✓			W	1		
3	G0.5	6/25/08 1020	✓	✓	✓	W/S	3		
4	GBG	6/25/08 1110	✓	✓	✓	W/S	3		
5	GBG2	6/25/08 1150	✓	✓	✓	W/S	3		
6	LR1	6/25/08 1205	✓	✓	✓	W/S	3		
7	G1.4	6/25/08 1335	✓	✓	✓	W/S	3		
8	H1	6/25/08 1415	✓	✓	✓	W/S	3		
9	HOB1	6/25/08 1440	✓	✓	X	W/S	3		
10	A1	6/25/08 1515	✓	✓	✓	W	2		

7/14/08 DNA

RELEASED BY:	PRINT NAME:	FIRM:	DATE:	TIME:	RECEIVED BY:	PRINT NAME:	FIRM:	DATE:	TIME:
[signature]	SETH SADOTSKY	ODEQ	6/26/08	9 AM					

ADDITIONAL REMARKS:

TEMP:

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COC REV 09/2004

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TestAmerica Sample Receipt Checklist

Cooler ID(s):

Work Order No.: PRF0916do

Client: DEQ - Eugene

Project: Black Butte Mine

Received by: (section A)

Date: [illegible]

Time: [illegible]

Initials: [illegible]

Unpacked by: (section B)

Date: [illegible]

Initials: [illegible]

Logged-in by:

Date: [illegible]

initials: [illegible]

Temperature out of range

___Not enough Ice
___No Ice
___Ice Melted
___Win 4 Hours
___Other:

***ESI Clients *(see Section C)*

Cooler Temperature (IR): [illegible] °C plastic glass NA *(oil/air OR ESI client)* Temperature Blank: _____ °C DIGI #1 #2

A

Custody Seals: (#___)

Signature: Y N Dated:_____

X None

Container Type:

1 #Cooler(s)

___#Box(s)

___None (___#Other:_____)

Coolant Type:

___Gel/ Blue Ice

X Loose Ice

___None

Packing Material:

___Bubble Bags

___Styrofoam Cubbies

___Peanuts

___None (X Other: plastic bags)

Received from:

___TA Courier

___Senvoy

X UPS

___Fed Ex

___Client

___TDP

___USPS

___SDS

___Mid-Valley

___GS/TA

___GS/Senvoy

___Other:

_____

B

Sample Status:

(If N circled, see NOD)

General:

Intact? (Y) N

Containers Match COC? Y (N) none given

IDs Match COC? (Y) N

For Analyses Requested:

Cyanide checked? Y N (NA)

Correct Type & Preservation? (Y) N

Adequate Volume? (Y) N

Within Hold Time? (Y) N

Volatiles/ Oil Quality:

VOAs/ Syringes free of Headspace? Y N (NA)

TB on COC? not provided Y N (NA)

Metals:

HNO3 Preserved? Y N (NA)

Dissolved Metals Filtered? Y N (NA)

C

***ESI Clients Only:

Temperature Blank: _____ °C not provided DIGI #1 #2

All preserved bottles checked Y N NA *(voas/soils/all unp.)*

All preserved accordingly? Y N *(see NOD)* NA *(voas/soils/all unp.)*

FED EX/ (UPS): Was the tracking paper keepable? (YES) NO

If circled NO, what is the Tracking number? _____

FED EX Goldstreak UPS DHL Other: _____

Project Managers:

Comments: _____

PM Reviewed: _____ *(Initial/Date)*

0049

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210
ORELAP#: OR100021

July 14, 2008

Bryn Thoms
DEQ- EUGENE
1102 Lincoln, Suite 210
Eugene, OR 97401

RE: Black Butte Mine

Enclosed are the results of analyses for samples received by the laboratory on 06/27/08 10:30. The following list is a summary of the Work Orders contained in this report, generated on 07/14/08 13:50.

If you have any questions concerning this report, please feel free to contact me.

Work Order	Project	ProjectNumber
PRF1004	Black Butte Mine	09-63680-38754

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
CED1	PRF1004-01	Water	06/26/08 11:00	06/27/08 10:30
CED1	PRF1004-02	Soil	06/26/08 11:00	06/27/08 10:30
J1	PRF1004-03	Water	06/26/08 11:25	06/27/08 10:30
J1	PRF1004-04	Soil	06/26/08 11:25	06/27/08 10:30
CFW1	PRF1004-05	Water	06/26/08 12:25	06/27/08 10:30
CFW1	PRF1004-06	Soil	06/26/08 12:25	06/27/08 10:30

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Darrell Auvil, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Mercury per EPA Method 1631E

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF1004-01 (CED1)			**Water**			**Sampled: 06/26/08 11:00**				
Mercury	EPA 1631E	ND	—	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:47	
PRF1004-03 (J1)			**Water**			**Sampled: 06/26/08 11:25**				
Mercury	EPA 1631E	ND	—	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:50	
PRF1004-05 (CFW1)			**Water**			**Sampled: 06/26/08 12:25**				
Mercury	EPA 1631E	ND	—	0.00500	ug/l	1x	8061139	06/30/08 14:25	07/01/08 10:52	

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report shall not be reproduced except in full, without the written approval of the laboratory.

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Total Mercury per EPA Method 7471A

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF1004-02 (CED1)			**Soil**			**Sampled: 06/26/08 11:00**				
Mercury	EPA 7471A	ND	----	0.0807	mg/kg dry	1x	8070072	07/02/08 13:09	07/02/08 14:33	
PRF1004-04 (J1)			**Soil**			**Sampled: 06/26/08 11:25**				
Mercury	EPA 7471A	ND	----	0.0703	mg/kg dry	1x	8070072	07/02/08 13:09	07/02/08 14:35	
PRF1004-06 (CFW1)			**Soil**			**Sampled: 06/26/08 12:25**				
Mercury	EPA 7471A	**0.302**	----	0.0870	mg/kg dry	1x	8070072	07/02/08 13:09	07/02/08 14:37	

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Darrell W. Auvil

Darrell Auvil, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
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ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Conventional Chemistry Parameters per Standard Methods

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF1004-01 (CED1)			**Water**			**Sampled: 06/26/08 11:00**				
Total Suspended Solids	SM 2540D	ND	—	9.26	mg/l	1x	8070027	07/01/08 11:00	07/01/08 17:48	
PRF1004-03 (J1)			**Water**			**Sampled: 06/26/08 11:25**				
Total Suspended Solids	SM 2540D	**8.13**	—	8.13	mg/l	1x	8070027	07/01/08 11:00	07/01/08 17:48	
PRF1004-05 (CFW1)			**Water**			**Sampled: 06/26/08 12:25**				
Total Suspended Solids	SM 2540D	ND	—	7.94	mg/l	1x	8070027	07/01/08 11:00	07/01/08 17:48	

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

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THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Percent Dry Weight (Solids) per Standard Methods

TestAmerica Portland

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
PRF1004-02 (CED1)			**Soil**				**Sampled: 06/26/08 11:00**			
% Solids	NCA SOP	66.3	—	0.0100	% by Weight	1x	8070113	07/03/08 09:09	07/03/08 09:09	
PRF1004-04 (J1)			**Soil**				**Sampled: 06/26/08 11:25**			
% Solids	NCA SOP	63.5	—	0.0100	% by Weight	1x	8070113	07/03/08 09:09	07/03/08 09:09	
PRF1004-06 (CFW1)			**Soil**				**Sampled: 06/26/08 12:25**			
% Solids	NCA SOP	57.8	—	0.0100	% by Weight	1x	8070113	07/03/08 09:09	07/03/08 09:09	

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Darrell Auvil, Project Manager

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PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Mercury per EPA Method 1631E - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8061139 **Water Preparation Method: EPA 1631**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8061139-BLK1)								Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	ND	--	0.00500	ug/l	1x	--	--	--	--	--	--	07/01/08 09:33	
LCS (8061139-BS1)								Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0488	--	0.00500	ug/l	1x	--	0.0500	97.5%	(85-115)	--	--	07/01/08 09:35	
LCS Dup (8061139-BSD1)								Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0491	--	0.00500	ug/l	1x	--	0.0500	98.3%	(85-115)	0.735%	(20)	07/01/08 09:39	
Duplicate (8061139-DUP1)					QC Source: PRF0966-01			Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	ND	--	0.00500	ug/l	1x	ND	--	--	--	NR	(20)	07/01/08 09:42	
Matrix Spike (8061139-MS1)					QC Source: PRF0966-01			Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0473	--	0.00500	ug/l	1x	0.000671	0.0500	93.3%	(71-125)	--	--	07/01/08 09:45	
Matrix Spike (8061139-MS2)					QC Source: PRF0966-17			Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0573	--	0.00500	ug/l	1x	0.00955	0.0500	95.4%	(71-125)	--	--	07/01/08 09:51	
Matrix Spike Dup (8061139-MSD1)					QC Source: PRF0966-01			Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0491	--	0.00500	ug/l	1x	0.000671	0.0500	96.8%	(71-125)	3.64%	(20)	07/01/08 09:48	
Matrix Spike Dup (8061139-MSD2)					QC Source: PRF0966-17			Extracted: 06/30/08 14:25						
Mercury	EPA 1631E	0.0576	--	0.00500	ug/l	1x	0.00955	0.0500	96.0%	(71-125)	0.521%	(20)	07/01/08 09:55	

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

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THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Total Mercury per EPA Method 7471A - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8070072 **Soil Preparation Method: EPA 7471A**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8070072-BLK1)								Extracted: 07/02/08 13:09						
Mercury	EPA 7471A	ND	---	0.100	mg/kg wet	1x	--	--	--	--	--	--	07/02/08 13:57	
LCS (8070072-BS1)								Extracted: 07/02/08 13:09						
Mercury	EPA 7471A	1.00	---	0.100	mg/kg wet	1x	--	1.00	100%	(80-120)	--	--	07/02/08 13:59	
LCS Dup (8070072-BSD1)								Extracted: 07/02/08 13:09						
Mercury	EPA 7471A	1.02	---	0.100	mg/kg wet	1x	--	1.00	102%	(80-120)	1.40%	(20)	07/02/08 14:03	
Duplicate (8070072-DUP1)					QC Source: PRF0898-04			Extracted: 07/02/08 13:09						
Mercury	EPA 7471A	18.8	---	3.19	mg/kg dry	1x	13.3	--	--	--	33.9%	(40)	07/02/08 14:07	
Matrix Spike (8070072-MS1)					QC Source: PRF0898-04			Extracted: 07/02/08 13:09						
Mercury	EPA 7471A	54.9	---	3.11	mg/kg dry	1x	13.3	31.1	134%	(75-125)	--	--	07/02/08 14:10	M1
Matrix Spike Dup (8070072-MSD1)					QC Source: PRF0898-04			Extracted: 07/02/08 13:09						
Mercury	EPA 7471A	49.3	---	3.05	mg/kg dry	1x	13.3	30.5	118%	(75-125)	10.7%	(40)	07/02/08 14:14	

TestAmerica Portland

Darrell Auvil, Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Conventional Chemistry Parameters per Standard Methods - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8070027 **Water Preparation Method: General Preparation**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Blank (8070027-BLK1)								Extracted: 07/01/08 11:00						
Total Suspended Solids	SM 2540D	ND	---	10.0	mg/l	1x	--	--	--	--	--	--	07/01/08 17:48	
LCS (8070027-BS1)								Extracted: 07/01/08 11:00						
Total Suspended Solids	SM 2540D	40.0	---	10.0	mg/l	1x	--	50.0	80.0%	(80-120)	--	--	07/01/08 17:48	
Duplicate (8070027-DUP1)					QC Source: PRF1017-01			Extracted: 07/01/08 11:00						
Total Suspended Solids	SM 2540D	53.3	---	6.67	mg/l	1x	53.3	--	--	--	0.00%	(20)	07/01/08 17:48	

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

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THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Percent Dry Weight (Solids) per Standard Methods - Laboratory Quality Control Results

TestAmerica Portland

QC Batch: 8070113 **Other dry Preparation Method: Dry Weight**

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
Duplicate (8070113-DUP1)					QC Source: PRF0994-01			Extracted: 07/03/08 09:09						
% Solids	NCA SOP	93.1	---	0.0100	% by Weight	1x	90.5	--	--	--	2.83%	(20)	07/03/08 09:09	

TestAmerica Portland

Darrell Auvil, Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

PORTLAND, OR 9405 S.W. NIMBUS AVENUE
BEAVERTON, OR 97008-7132
ph: (503) 906.9200 fax: (503) 906.9210

DEQ- EUGENE	Project Name:	**Black Butte Mine**	
1102 Lincoln, Suite 210	Project Number:	09-63680-38754	Report Created:
Eugene, OR 97401	Project Manager:	Bryn Thoms	07/14/08 13:50

Notes and Definitions

Report Specific Notes:

M1 - The MS and/or MSD were above the acceptance limits due to sample matrix interference. See Blank Spike (LCS).

Laboratory Reporting Conventions:

DET - Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.

ND - Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).

NR/NA - Not Reported / Not Available

dry - Sample results reported on a Dry Weight Basis. Results and Reporting Limits have been corrected for Percent Dry Weight.

wet - Sample results and reporting limits reported on a Wet Weight Basis (as received). Results with neither 'wet' nor 'dry' are reported on a Wet Weight Basis.

RPD - RELATIVE PERCENT DIFFERENCE (RPDs calculated using Results, not Percent Recoveries).

MRL - METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.

MDL* - METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. *MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated Results.

Dil - Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.

Reporting Limits - Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.

Electronic Signature - Electronic Signature added in accordance with TestAmerica's *Electronic Reporting and Electronic Signatures Policy*. Application of electronic signature indicates that the report has been reviewed and approved for release by the laboratory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

TestAmerica Portland

Darrell W. Auvil

Darrell Auvil, Project Manager

TestAmerica
ANALYTICAL TESTING CORPORATION

CHAIN OF CUSTODY REPORT

Work Order #: PRF1004

CLIENT: DEQ
REPORT TO: Bryn Thoms
ADDRESS: [illegible] St Suite 212
PHONE: 541 687 [illegible] FAX: 541 686 7551
PROJECT NAME: Black Butte Mine
PROJECT NUMBER: 07-63680-38754
SAMPLED BY: Sadofsky

INVOICE TO: Same

P.O. NUMBER: [illegible]

TURNAROUND REQUEST in Business Days *
OTHER Specify: Per Contract

PRESERVATIVE: HCl

REQUESTED ANALYSES

CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	1631 Hg	160.2 TSS	7471A Hg	MATRIX (W, S, O)	# OF CONT.	LOCATION COMMENTS	TA WO ID
1 CED1	6/26/08 1100	✓	✓	✓	W/S	3		
2 J1	6/26/08 1125	✓	✓	✓	W/S	3		
3 CFW1	6/26/08 1225	✓	✓	✓				
4								
5								
6								
7								
8								
9								
10								

RELEASED BY: [signature] PRINT NAME: SETH SADOFSKY FIRM: DEQ DATE: TIME:
RECEIVED BY: [signature] PRINT NAME: Regan Siegfried FIRM: TAP DATE: 6/27/08 TIME: 1036
RELEASED BY: PRINT NAME: FIRM: DATE: TIME:
RECEIVED BY: PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS:

TEMP: 3.6 PAGE 1 OF 1

COC REV 09 2004

1900

TestAmerica Sample Receipt Checklist

Cooler ID(s):

Received by: (section A) Date: 6/27/08 Time: 1230 Initials:

Unpacked by: (section B) Date: 6/27/08 Initials:

Logged-in by: Date: 6/27/08 Initials: JI

Work Order No. PRF1004

Client: DEQ-Eugene

Project: Black Butte Mine

Temperature out of range:

___Not enough Ice
___No Ice
___Ice Melted
___W/in 4 Hours
___Other:

***ESI Clients (see Section C)

Cooler Temperature (IR): 3.6 °C plastic glass NA (oil/air OR ESI client) Temperature Blank: _____ °C DIGI #1 #2

A

Custody Seals: (#____)

Signature: Y N Dated:_____

X None

Container Type:

____#Cooler(s)

____#Box(s)

____None (___#Other:_____)

Coolant Type:

____Gel/ Blue Ice

X Loose Ice

____None

Packing Material:

____Bubble Bags

____Styrofoam Cubbies

____Peanuts

X None (____Other:_____)

Received from:

____TA Courier

____Senvoy

X UPS

____Fed Ex

____Client

____TDP

____USPS

____SDS

____Mid-Valley

____GS/TA

____GS/Senvoy

____Other:

_____

2900

B

Sample Status:

(If N circled, see NOD)

General:

Intact?	Y	N	
# Containers Match COC?	Y	N	none given
IDs Match COC?	Y	N	

For Analyses Requested:

Cyanide checked?	Y	N	NA
Correct Type & Preservation?	Y	N	
Adequate Volume?	Y	N	
Within Hold Time?	Y	N	

Volatiles/ Oil Quality:

VOAs/ Syringes free of Headspace?	Y	N	NA
TB on COC? not provided	Y	N	NA

Metals:

HNO3 Preserved?	Y	N	NA

C

***ESI Clients Only:

Temperature Blank: ___

All preserved bottle

All preserved accor

SIGNATURE 6/27/08 DATE

Custody Seal

Tes

THE LEADE

9405 SW NIMBUS AVE

BEAVERTON OR 97008-7145

P: BLUE, S: 100 I: 7B

122-2180

K1074476304

TJJ7CGR ORTURIJB Jun 27 05:29:05 2008
TB 9705 HIP 7.0.6 LP2844

IO

Comments:

PM Reviewed:

Final
Mercury Loading Assessment Workplan
Coast Fork Willamette River &
Black Butte Mine

DEQ ECSI #1657

May 7, 2008

Prepared By:

Bryn Thoms, R.G.

Oregon Department of Environmental Quality

MERCURY LOADING ASSESSMENT
WORKPLAN
COAST FORK WILLAMETTE RIVER &
BLACK BUTTE MINE

The following workplan will be used to direct sampling and assessment activities in the Coast Fork Willamette River (CFW) Watershed above Cottage Grove Reservoir (CG Res.) in support of evaluating the various mercury loads within the watershed. The results of the assessment will be used to evaluate the mercury load from Furnace Creek as it compares to the rest of the watershed. Tailings on Furnace Creek were not removed during the EPA Removal in August 2007 due to limited funding. Sediment and surface water sample results in Furnace Creek near the old furnace and down stream suggest that Furnace Creek could be a significant source of mercury to the watershed. The results of this assessment will provide DEQ management a quantitative evaluation of the need for further cleanup work on Furnace Creek at the former Black Butte Mine.

Site Background

The Black Butte Mine (BBM) is a former mercury mine located in southern Lane County, Oregon. Brooks (1963) lists the BBM as Oregon's fourth largest producer of mercury. The BBM was identified in recent Total Maximum Daily Load (TMDL) investigations (ODEQ 2003) as a significant contributor of mercury to sediment and fish tissue in Cottage Grove Reservoir, located approximately six miles downstream of BBM. CG Res., and the main stem of the Willamette River, the nation's 13th largest watershed, are water quality limited for mercury, and the Oregon Department of Human Services has issued health advisories to limit consumption of fish harvested from the watershed due to elevated mercury concentrations in fish tissue. The Willamette River also is home to several threatened or endangered species. The Coast Fork Willamette River flows into CG Res. and eventually drains into the Willamette River. Figure 1 presents a site location map.

In August 2007 EPA conducted a removal of mercury-contaminated soil at the site. Soil (tailings, waste rock, and furnace wastes) were either covered with "clean" soil or removed and disposed on site in a repository, depending on the mercury concentration. Prior to the removal work, EPA identified several areas on site that required some form of removal. During the removal activities additional assessment was conducted on Furnace Creek. However, due to the large volume of contaminated material needing attention and the estimated cost to remove, EPA was not able to conduct removal work on Furnace Creek.

Additional background information is available in the documents presented in the References Section below.

Project Description

The overall project objective is to identify the relative contribution of Hg to the Coast Fork Willamette from the individual drainages within the CFW watershed. The information will be used to confirm the need to conduct additional removal on Furnace Creek.

The specific objectives and scope for performing sampling activities at this site are as follows:

- Collect surface water samples and sediment samples for total Hg analysis at the approximately 19 locations within the watershed. Water samples will also be analyzed for Total Suspended Solids (TSS).

- Collect stream discharge parameters (flow and stream cross-sectional area) at each sample location

- Use stream discharge and analytical results to develop annual Hg loading estimates for individual stream drainages (approximately 7th field-sized watersheds) within the watershed.

- Prepare a report of the findings of the assessment, including a comparison of Hg loads from the individual drainages to the Furnace Creek drainage.

- Prepare recommendations to conduct any additional investigation and/or cleanup.

Site Location and Information

Site Name:	Former Black Butte Mine (Black Butte Mine)
Location:	South end of London Road, uphill from gate address (70835 London Rd.)
Latitude:	42.5788 °
Longitude:	-123.0689 °
Public Land Survey:	Township 23 South, Range 3 West, Section 8, SE 1/4
Map and Tax Lot Number:	Map 23030800, lot 800
County:	Lane County
Site Contacts 1:	Bob Smejkal The Land and Timber Company (Owner) 696 Country Club Road Eugene, OR 97401 Office # 541-345-3330 Michael Pooler (resident at entrance gate and site manager) 70835 London Road Cottage Grove, OR 97424 541-942-1008

Site Hydrology and Contaminant Sources

The BBM is located in southern Lane County, in the CFW watershed, approximately 10 miles south of Cottage Grove, Oregon off London Road (Figure 1). The BBM site is on the northwest flank of Black Butte. Access to the site is restricted by a locked gate; however, a gravel road leading onto the site from London Road crosses private property (Pooler residence). Michael Pooler currently lives at the entrance to the site.

The BBM site consists of the main millsite which is situated at approximately 1200 feet above mean sea level (amsl) on a fairly level area below the main ore body and adits. The millsite is located between two creeks, Dennis Creek on the north and Furnace Creek on the south. A large tailings pile referred to as the main tailings pile, is located on the north side of the millsite and the toe of the tailings pile adjoins Dennis Creek. Mercury concentrations in the main tailings pile are generally less than 100 milligrams per kilogram [mg/Kg] Hg. During the EPA Removal, there was evidence of erosion of the base of the tailings pile by Dennis Creek. The main tailings pile was stabilized and covered with vegetation during the EPA Removal.

Tailings (about 400 to 2000 mg/Kg Hg) were also found on the banks and under Furnace Creek during the EPA Removal. A length of approximately 1000 feet of Furnace Creek showed signs of tailings being actively eroded. The depth of the tailings below the creek could be up to 8 feet deep. Also, evidence of mass wasting such as mud and debris against the upstream side of large firs on the stream banks, was identified on the upper portion of Furnace Creek adjacent to the former furnace area. This suggests that erosion of highly-contaminated soils in Furnace Creek could continue for several decades or more.

Based on the soil sampling assessment conducted by OSU and DEQ in 2003 and documentation from various sources (DEQ toxicology working group, Khandoker, and USGS) Hg concentrations in soil within the watershed can be categorized into three different ranges:

- Background in the country rock (unmineralized marine sediments [Calapooya Formation]) - 0.02 to 0.11 mg/Kg
- Mineralized rock/soil (hydrothermally altered zones of the Calapooya Formation, but not ore grade rock) – 1 to 10 mg/Kg
- Ore, tailings, and waste rock (ore body and waste rock materials associated with mining) – 100 to 2000 mg/Kg

Figure 2 presents the mineralized zones as well as the approximate location of the Black Butte Mine ore body and millsite area (mostly tailings and waste rock). The following is a list (presented from south to north) of background Hg sources identified in the USGS Bulletin 850 "Quicksilver Deposits of Southwestern Oregon" which are presented on the figure. Other than the BBM millsite and ore body, these areas are mineralized zones and soil Hg concentrations within these zones likely range from 1 to 10 mg/Kg.

Bald Butte/Cinnabar Mountain – Located south of the confluence of Little River and Garoutte Creek, south of the main BBM mineralized zone. This zone drains to Cinnabar Creek, Little River, and possibly to Garoutte Creek above the confluence.

Black Butte Mine – Includes the BBM millsite as well as the ore body at the top of Black Butte and surrounding area. This zone drains to Trail creek (south side of Black Butte), Little River, Garroutte Creek, Furnace Creek, and Dennis Creek.

Sullivan Prospects – Located on the north side of Dennis Creek, just north of the BBM zone and drains to Dennis Creek, the Big River to the north, and Garoutte Creek to the west.

Hobart Butte – Located northwest of Sullivan Prospects and drains to Hambrick Creek, Hobart Creek, and the CFW River.

Based on the information presented above, Hg concentrations in the streams draining the mineralized zones should be elevated in comparison to the Hg concentrations in the streams draining the country rock (un-mineralized).

Conceptual Mercury Loading Model

Historical surface water and sediment data collected from the site and from the CFW River for the Willamette TMDL assessment suggests that the main form of Hg migration from BBM is by suspension of particulate Hg during high seasonal surface water flow. Particulate HgS is the most common form of Hg that leaves the site in surface runoff.

Speciation analysis of 11 waste rock, tailings, and sediment samples conducted for the OSU/DEQ Hg reconnaissance study in 2003 and for the EPA Removal Assessment of 2005 identified that HgS and elemental Hg in tailings and furnace-area soils, and on-site sediment represent 40% to 90% of the Hg within those sources. HgS and elemental Hg area identified as fraction F5 in the sequential extraction process (Bloom, et al), where F1 represents the most soluble Hg species. Elemental is simply included in the fraction due to its solubility being similar to HgS, yet earlier headspace analysis suggests that elemental Hg is likely not a significant contributor to the F5 fraction at BBM. In addition, synthetic leaching procedure (SPLP) analysis was conducted for 5 soil samples collected from waste rock and tailings during the EPA Removal Assessment. The results were all non-detect at 2 micrograms per liter (ug/L), suggesting that the dissolution of Hg from soil particles is not a significant contributor to off-site migration of Hg. SPLP reagent attempts to mimic leaching properties of rainfall.

Based on the information presented above, the most common form of Hg that leaves BBM in surface water is particulate HgS. There may be lesser amounts of other Hg species adhered or adsorbed to organics and soil particles at and near BBM, however Total Hg analysis will be conducted so there will not be a need to differentiate species.

If we know that the main transport mechanism is suspension of HgS particles within surface water, we must then attempt to measure surface water flow or discharge to calculate the load. Basic geomorphology suggests that with more energy in the stream system, more mass will be suspended and carried downstream. That mass could be larger particles of sand and gravel (bed load) or could be larger volumes of smaller particles such as silt and clay (suspended solids). It is expected that the suspended solids will travel farther than the bed load. With enough stream discharge data coupled with TSS and Total Hg in water, TSS may be used as a surrogate to roughly estimate Hg loads of individual streams. Also, based on the Willamette TMDL Model (DEQ 2003), TSS coupled with Hg concentrations in soil and stream discharge data, Hg load estimates can be calculated for individual drainages. This is the principle used to develop background Hg loads from undeveloped areas within the Willamette Basin for the Hg TMDL.

The bed load Hg mass is not included in the conceptual Hg load model because the volume and movement of bed load is difficult to quantify. Also, bed load generally ranges from 5 to 10% of the total load. Hg concentrations in sediment collected throughout the watershed will provide a qualitative analysis of the bed load Hg concentrations and to some extent the analysis will identify streams that may act as significant Hg sources during storm events. Fine-grained sediment (silt and clay) was difficult to find in previous sediment sampling efforts in the watershed. This suggests that silt and clay particles tend to remain in suspension throughout the system until they reach a low-energy environment such as CG Res.

The loading analysis calculations are based on the principle that a one-time Hg concentration within a stream can be multiplied by the stream discharge at the time of sample collection to get a mass of Hg within the stream. This mass is referred to as the load which can be expressed in units such as grams per second, grams per day, or grams per year. The following equation, used in the development of the Willamette Hg TMDL, will be used to calculate Hg loads per drainage:

$M = CQ\ (FC)\ (TC)\ (UC)$

Where M = mass load in grams per year (g/yr)
C = Hg concentration in nanograms per liter (ng/L)
Q = stream discharge in cubic feet per second (cfs)
FC = flow rate conversion (28.32 liter per cubic foot [L/ft^3])
TC = time conversion (31,536,000 seconds per year [s/yr])
UC = unit conversion (10^{-9} g/ng)

Hg loads calculated from historical information from Dennis Creek, Furnace Creek, and the CFW are generally presented in annual mass, such as grams per year. It should be noted that a one-time sample collected during spring base flow is not necessarily representative of the whole year, because of the variety in discharge which is related to fluctuations in precipitation. However, based on monthly USGS stream discharge data for the formerly active USGS gauge station (14152500) at London on the CFW River, non-storm-related discharge in the spring (spring base flow) approximates mean annual discharge. Average monthly discharge data (based on data from 1935 to1986) is 202 ft^3/s. The average monthly discharge during March (351), April (248), and May (149) is 249 ft^3/s. The peak monthly mean flows are during December at 405 and January at 416 and the low monthly mean flows are during August at 20 and September at 23 ft^3/s.

There has been limited analysis of Hg transport during storm events at BBM and in the CFW watershed. This assessment should be conducted at various flow stages in order to fully understand the variation in Hg loads from season to season. However, there is limited funding and time, thus an estimated Hg load must be calculated using a one-time flow measurement collected when the water sample is collected. It should be kept in mind that the objective of this assessment is to identify relative differences between Hg loads from individual drainages within the watershed. Storm events provide more energy to the whole system, not just to one drainage thus the relationship between Hg loads from individual drainages should remain fairly constant with changes in rainfall. This assumes that the individual drainages within the watershed have similar vegetative cover, similar soil type, and similar slope.

Table 1 presents total Hg results from surface water samples collected from the CFW River at London during the Willamette TMDL assessment work in 2002 and 2003. Total Hg in the December (6.72 ng/L) is almost twice the Hg concentration of samples collected in June (3.75 ng/L). Table 1 also presents the monthly mean discharge of the CFW River at the USGS gauge in London for the months that the samples were collected. Within the dataset, the December sample has the Hg concentration, the June sample has the lowest, and the March sample has a mid range concentration. This qualitatively suggests that as discharge increases, Hg concentration does also.

Additional analysis of the data using TSS and USGS gauging stations in nearby watersheds may be useful for future evaluation of seasonal fluctuations of Hg loads.

Historical Hg Loading Analysis

Table 1 presents total Hg in water and sediment, TSS, stream discharge, and calculated Hg loads for pre-removal surface water assessment data collected in April 2007. The table also presents historical Hg data collected for the Willamette TMDL assessment in 2002 and 2003. Discharge information was not available for the TMDL samples. Pre-Removal assessment Hg load estimates indicates that Furnace Creek contributes approximately 90 grams of Hg to the system in one year. This is a very rough estimate due to the difficulty in collecting an accurate stream discharge on Furnace Creek. Half of the detection

limit was used for calculating a load for samples that were non-detect at 5 ng/L. This likely biases the Hg load result on the high side.

The approximate Hg load from Garoutte Creek (includes contributions from Furnace and Dennis Creeks and nearby mineralized zones) was 340 g/yr. This indicates that Furnace Creek contributes approximately 27% of the mass of Hg to the Garoutte Creek drainage. Dennis Creek load was approximately 28 g/yr, which is about 8% of the load to the Garoutte Creek drainage.

The assessment work proposed in this workplan will duplicate the work conducted in 2007 and will include assessment of the remaining drainages in the watershed. Figure 3 presents the 2007 sample locations, the proposed sample locations, and a conceptual model of the drainages within the watershed.

Sampling Plan

Nineteen surface water and sediment samples will be collected at the proposed locations presented on Figure 3 and Table 2. Each surface water sample will be analyzed for total Hg using low level detection methods (EPA Method 1631 with a detection limit of 0.2 nanograms per liter [ng/L]). Surface water samples will also be collected for analysis of TSS using EPA Method 160.2 with a detection limit of 10 milligrams per liter (mg/L). At each of the sample locations, sediment will be collected for analysis of total Hg using EPA Method 7471A with a detection limit of 0.1 milligrams per kilogram (mg/Kg) and for stream discharge (Q) following USGS stream survey methods (velocity-area method).

The locations presented on Figure 2 were chosen based on a combination of the following factors:

- farthest downstream point that receives waters from the drainage being assessed
- publicly accessible
- duplication of previously sampled location (such as the BBM sites)
- Inclusion of mineralized zones

During fieldwork there will likely be additional sighting criteria that will effect the sample location. These may include poor stream morphology for discharge measurements, limited access, safety concerns, or time and budget constraints. If a sample location is not sampled or a sample location is moved the reason for the change will be documented in the field notes.

Numbers Creek, H Taylor Creek, and the unnamed tributary downstream of Coombs Creek were not included in the proposed assessment work simply due to their small size and limited influence on the system. The sample location on the CFW River just upstream of the CG Res. will capture Hg contributions from those streams.

The following is a list of the drainages and their abbreviations presented on Figure 3 from upstream to downstream order. Also, the anticipated Hg concentration in soil within the drainage is also presented as a crude estimate of the potential source concentrations available to that drainage, based on the geologic information presented in the *Site Hydrology and Contaminant Sources* Section above.

BR1 – Big River – No known mineralized zones, soils likely less than 1 mg/Kg Hg
G1 – Garoutte Creek – Includes mineralized zones and BBM millsite soils (up to 2000 mg/Kg Hg)
G2 – Garoutte Creek – May have slight impact from mineralized zone on Little River (10 mg/Kg)
LR1 – Little River – Includes mineralized zone (10 mg/Kg), Cinnabar Creek
F1 – Furnace Creek - Includes mineralized zones and BBM millsite soils (up to 2000 mg/Kg Hg)
D1 – Dennis Creek - Includes mineralized zones and BBM millsite soils (up to 2000 mg/Kg Hg)
C1 – Combs Creek - No known mineralized zones, soils likely less than 1 mg/Kg Hg

H1 – Hambrick Creek - Includes mineralized zone (10 mg/Kg), Hobart Butte
HOB1 – Hobart Creek - Includes mineralized zone (10 mg/Kg), Hobart Butte
A1 – Anderson Creek - No known mineralized zones, soils likely less than 1 mg/Kg Hg
SR1 – Shortridge Creek - No known mineralized zones, soils likely less than 1 mg/Kg Hg
J1 – Johnson Creek - No known mineralized zones, soils likely less than 1 mg/Kg Hg
CF1 – Coast Fork Willamette - Includes mineralized zones and BBM millsite soils (up to 2000 mg/Kg Hg)
CED1 – Cedar Creek - No known mineralized zones, soils likely less than 1 mg/Kg Hg
W1 – Wilson Creek - No known mineralized zones, soils likely less than 1 mg/Kg Hg

Surface water samples will be collected for total Hg analysis using EPA's low level detection Method 1631 with an anticipated detection limit of 0.2 nanograms per liter (ng/L). Sampling activities will follow EPA's sampling methodology for trace metals (Method 1669, "clean hands/dirty hands"). Water sample jars will be opened beneath the surface of the water in an area of the stream that best approximates the whole stream channel environment and where the sample jar can be placed in the stream without disturbing sediment. Water samples will also be collected for TSS analysis by EPA method 160.2 with a detection limit of 10 mg/Kg.

Sediment samples will be collected after the water samples in order to reduce potential turbidity impacts to the water samples. Sediment samples will be analyzed for total Hg using the EPA standard metals analysis Method 7471 with an anticipated detection limit 0.1 mg/Kg. Sediment samples will be collected using new, disposable plastic scoops and an attempt will be made to pour off the supernatant water in each scoop, without loss of fine-grained particles, before transferring to the jar.

Field parameters for water (temperature, pH, and conductivity) will be collected at each sample location.

Stream gauging following standard USGS methods will take place at each sample location, if possible. This will include measuring the stream channel cross-sectional area and collecting flow data using a handheld digital flow meter (Marsh-McBirney Flo-Mate) along the plane of cross section. GPS coordinates will be collected at each sample location. A field log will be maintained for documentation of the sampling work.

Samples will be placed in certified clean jars provided by the laboratory, labeled, and placed on ice in a cooler. Sample labels will include sample number, project name, date and time of collection, analysis required, and preservative (if applicable). Samples will be delivered under chain-of-custody procedures to the DEQ contract lab, TestAmerica within 48 hours of sample collection. Analyses will take place under standard turnaround time period.

All instruments and equipment used during fixed laboratory sample analyses will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations, as well as criteria set forth in the applicable analytical methodology references. In the cases where laboratory results do not meet QC acceptance criteria, re-extraction and/or re-analysis will occur as indicated in the applicable analytical method. The respective laboratory analysts will be responsible for ensuring that appropriate sample analysis procedures are followed and for taking appropriate actions to ensure deficiency correction.

Field Sampling Quality Assurance/Quality Control

In order to maintain the quality of the samples during sample collection and to support the validity of the sample results, sample collection activities will be performed in accordance with the EPA-approved

DEQ's Quality Assurance Program Plan (QAPP) dated March 2004 and presented in Appendix 1. In addition, several quality assurance samples will be collected in the field. Table 2 presents the proposed field QA samples as F1 Dup, G1 Dup, BBM Tran1, and BBM Tran2.

The F1 and G1 Dup samples are duplicate samples (aliquot of the primary sample) that will be collected for both surface water and soil in order to evaluate the consistency of the sample collection procedures. Locations were chosen because historical Hg results are relatively high at those locations. The surface water aliquot will be collected immediately after the primary sample in the same fashion that the primary sample was collected. The sediment sample aliquot will be filled be using the scoop designated for that sample location by filling the primary sample jar then the aliquot in an alternating fashion.

BBM Tran1 and CFW Tran2 are transfer blanks that will be used to identify potential contributions from air borne Hg. The project target concentrations for Hg are so low (MRL = 0.2 ng/L) that low levels of Hg in dust or other airborne contaminants associated with the BBM millsite could impact sample quality. BBM Tran1 will be collected near F1 because that is one of the few areas remaining on the BBM millsite with elevated surface soil concentrations. CFW Tran2 will be collected near CF1, far from the BBM millsite and will be used identify potential widespread air borne Hg contributions. Transfer blanks will be collected by slowly transferring laboratory-supplied deionized water to sample bottles.

Logistics

Two DEQ samplers will collect samples and stream discharge data during the week of April 21, 2008. Samples will be collected on Lane County Right-of-Way (ROW), such as London Road ROW where streams cross, or on the Coast Fork Willamette River below ordinary high water in Division of State Lands (DSL) jurisdiction. Public tax lots are presented on Figure 2. Samples may also be collected on BLM property, if needed. Access to BBM has been granted by the property owner through an access agreement for the on site sample locations.

The majority of the streams will be small enough to cross in chest waders in order to collect cross-sectional and flow information. The CFW River may be too large to safely cross. If this is the case, US Army Corps of Engineers (ACOE) reservoir data will be utilized to calculate an estimated flow for the time of sample collection. There are no active USGS gauging stations within the study area.

Samples will be submitted to Test America in Beaverton, which is an approved National Environmental Laboratory Accreditation Conference (NELAC) laboratory. Analyses will take place under standard turnaround time period.

The previously-approved Health and Safety Plan (HASP) presented in Appendix A will be followed during field activities.

Reporting

A report summarizing the findings of site activities will be completed following the site investigation. The report will include a discussion of field activities, site map with sample locations, Hg concentrations in surface water and sediment, table presenting results and the estimated Hg load from the streams within the watershed and appendices including laboratory reports, and filed documentation. The report will also present an updated analysis of Hg loading conceptual model and recommendations for future cleanup or assessment work at BBM.

References

Bloom, N.S., Preus, E., Katon, J., M. Hiltner, 2003, Selective extractions to assess the biogeochemically relevant fractionation of inorganic mercury in sediments and soils, Analytica Chimica Acata 479 (2): 233 – 248.

Oregon Department of Environmental Quality (ODEQ), 2003, *Willamette River Basin Total Maximum Daily Load Project: Estimates of Mercury Mass Loads and Sources in the Willamette River Basin, Draft Final,* August 6, 2003.

Oregon State University (OSU), 2004, *Reconnaissance Soil Sampling at the Black Butte Mine,* prepared for the Oregon Department of Environmental Quality, Larry R. Curtis, Department of Environmental & Molecular Toxicology, August 9, 2004.

Ecology & Environment, March 2006, *Black Butte Mine Removal Assessment Report*, prepared for United States Environmental Protection Agency (EPA).

DEQ, 2003 memo to file – Black Butte Mine Hg Assessment October 2003 Data, Figures, Analysis, prepared by Bryn Thoms for derivation of Background Hg concentrations and references several studies (DEQ Toxicology Working Group, Khandoker, and USGS).

DEQ, March 2004, *Quality Assurance Project Plan, DEQ-04-LQ-004-QAPP.*

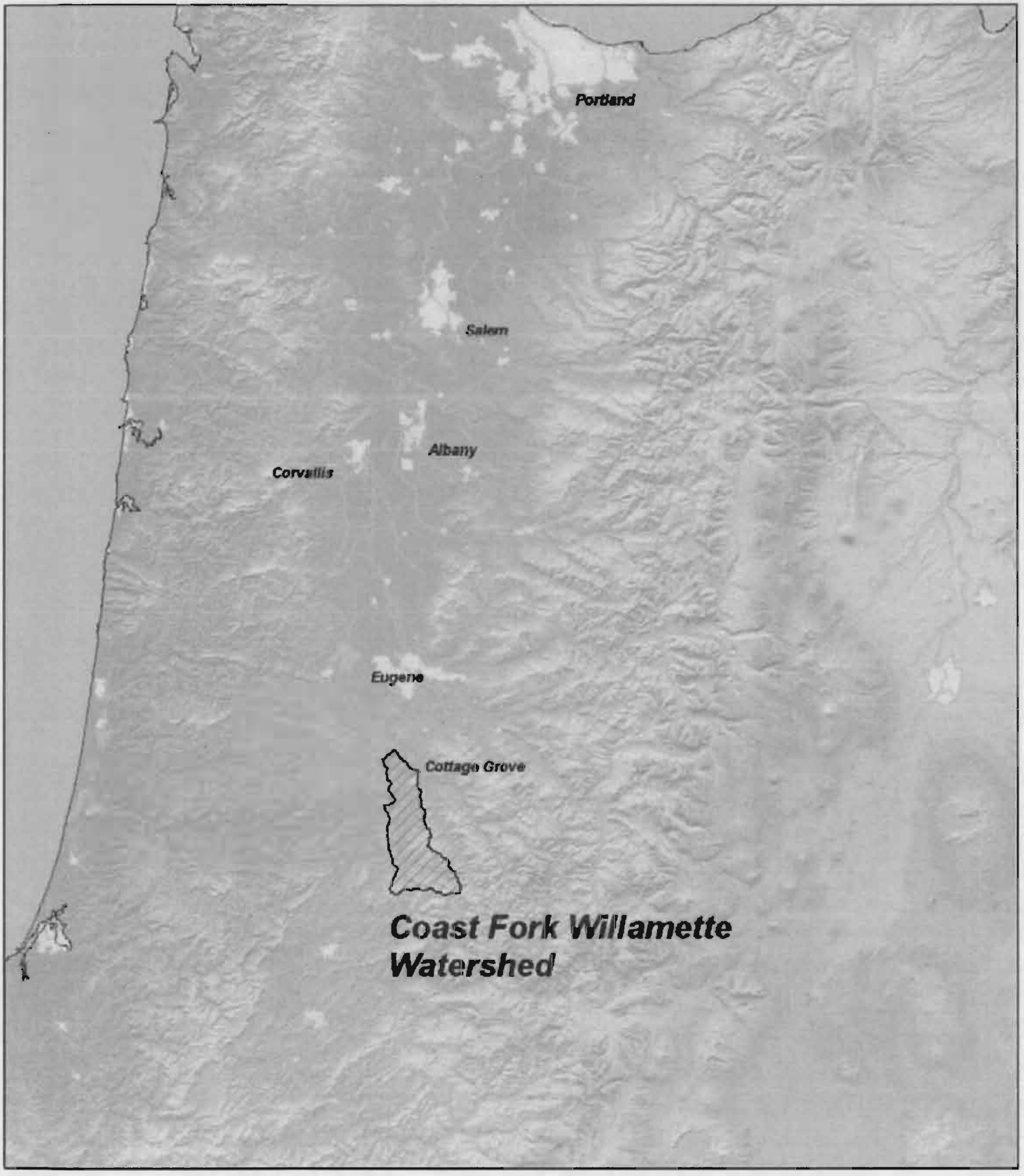
United States Geological Survey (USGS), 1934, *Quicksilver Deposits in Southwestern Oregon*, Bulletin 850

Attachments:

Figure 1 – Site Location Map
Figure 2 – Altered/Mineralized Zones and Public Tax Lots
Figure 3 – Proposed Sample Locations and Conceptual Loading Model

Table 1 – Historical Hg Results and Estimated Hg Loads
Table 2 – Proposed Analytical

Appendix A : Site Health and Safety Plan



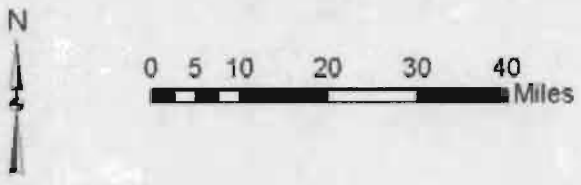


Figure 1
Site Location Map
Mercury Loading Assessment
Black Butte Mine/Coast Fork Willamette

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WA 98101

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Document ID #: 1322310

File #: 4.1V2

Site Name: Black Butte Mine (BUTCF)

Figure 2 Altered/Mineralized Zones and Public Tax Lots Mercury Loading Assessment Black Butte Mine/Coast Fork Willamette 0074

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WA 98101

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Figure3 Proposed Sample Locations and Conceptual Loading Model Mercury Loading Assessment Black Butte Mine/Coast Fork Willamette 0075

Table 1
Analytical Results
Surface Water Assessment 2007
Black Butte Mine

Site ID	Stream Name	Comment	Sampled Date	T. Hg (ng/L) in Water EPA Method 1631	T. Hg (mg/Kg) in Sediment EPA Method 7471A	TSS (mg/L) in water EPA Method 160.2	Discharge (cfs) USGS Method	Estimated Hg Load g/year
From 2007 Pre-Removal Assessment								
G1	Garoutte Creek		4/4/2007	8.76	1.27	NA	43.0	340
GBG	Garoutte Creek	background	4/4/2007	<5	1.29	NA	NA	89
D1	Dennis Creek	downstream	4/4/2007	9.9	1.65	NA	3.2	28.1
DBG	Dennis Creek	upstream	4/4/2007	8.42	2.02	NA	NA	24
F1	Furnace Creek	downstream	4/4/2007	3050	120	NA	0.033	91.25
FBG	Furnace Creek	upstream	4/4/2007	18	1.67	NA	NA	0.53
Field QA/QC Samples								
T1	Transfer Blank	air tranfser	4/4/2007	<5	NA	NA	NA	NA
D1 Dup	Duplicate of D1		4/4/2007	9.84	1.29	NA	NA	NA
Historical Samples								
Dennis Mouth	Dennis Creek	near D1	10/7/2002	6.13	NA	<2	NA	NA
Dennis Mouth	Dennis Creek	near D1	12/12/2002	9.94	NA	<2	NA	NA
Dennis Mouth	Dennis Creek	near D1	3/19/2003	12.9	NA	2.6	NA	NA
Dennis Mouth	Dennis Creek	near D1	6/18/2003	18.5	NA	3	NA	NA
CF at London	CF Willamette		9/3/2002	NA	0.451	NA	NA	NA
CF at London	CF Willamette		10/7/2002	3.99	NA	<2	61	217
CF at London	CF Willamette		12/12/2002	6.72	NA	<2	405	2431
CF at London	CF Willamette		3/19/2003	4.31	NA	<2	351	1351
CF at London	CF Willamette		6/18/2003	3.51	NA	<2	79	248
CF at London	CF Willamette		6/18/2003	3.75	NA	<2	79	265

Note:
Comment - "background" refers to location of sample site relative to nearby source watershed
Comment - "upstream/downstream" refers to location of sample site relative to nearby millsite source
T. Hg - Total Mercury
ng/L - nanograms per liter
mg/Kg - milligrams per kilogram
mg/L - milligrams per liter
EPA Method 1631 detection limit - 5 ng/L
EPA Method 7471A detection limit - 0.1 mg/Kg
Discharge - Stream discharge (Q) in cubic feet per second (cfs), calculated using flow meter and cross-sectional area of stream channel
Discharge results for CF at London from 10/02 to 6/03 are monthly means calculated from USGS historical data for the month the Hg sample was collected.
Air transfer - Lab DI water transferred from lab bottle to sample bottle following method desrcibed in workplan
Hg Load - Annual load in grams (g) is based on discharge remaining the same throughout the year, thus it is an estimate
<5 - Less than the detection limit of 5
NA -not available, not analyzed, or not applicable

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Table 2
Proposed Analytical
Surface Water Assessment 2008
Black Butte Mine

Site ID	Stream Name	Comment	Proposed Analytical			
			T. Hg (ng/L) in Water EPA Method 1631	T. Hg (mg/Kg) in Sediment EPA Method 7471A	TSS (mg/L) in water EPA Method 160.2	Discharge (cfs) USGS Method
From 2007 Pre-Removal Assessment						
G1	Garoutte Creek	downstream of Dennis	X	X	X	X
GBG1	Garoutte Creek	background	X	X	X	X
D1	Dennis Creek	downstream of tailings	X	X	X	X
DBG	Dennis Creek	upstream of tailings	X	X	X	X
F1	Furnace Creek	downstream of tailings	X	X	X	X
FBG	Furnace Creek	upstream of tailings	X	X	X	X
New Sample Sites						
BR1	Big River	background	X	X	X	X
GBG2	Garoutte Creek	background	X	X	X	X
G0.5	Garoutte Creek	downstream of Furnace	X	X	X	X
G1.5	Garoutte Creek	downstream of Dennis	X	X	X	X
G1.75	Garoutte Creek	downstream of Dennis	X	X	X	X
G2	Garoutte Creek	downstream of Dennis	X	X	X	X
C1	Combs Creek	background	X	X	X	X
H1	Hambrick Creek	background	X	X	X	X
HOB1	Hobart Creek	background	X	X	X	X
A1	American Creek	background	X	X	X	X
SR1	Shortridge Creek	background	X	X	X	X
J1	Johnson Creek	background	X	X	X	X
CF1	Coast Fork Willamette	background	X	X	X	X
W1	Wilson Creek	background	X	X	X	X
CED1	Cedar Creek	background	X	X	X	X
Field QA/QC Samples						
F1 Dup	Duplicate at F1		X	X	--	--
G1 Dup	Duplicate at G1		X	X	--	--
BBM Tran1	Air Transfer	near F1	X	--	--	--
BBM Tran2	Air Transfer	far from BBM	X	--	--	--

Note:
Comment - "background" refers to location of sample site relative to nearby source watershed
Comment - "upstream/downstream" refers to location of sample site relative to nearby millsite source
T. Hg - Total Mercury
ng/L - nanograms per liter
mg/Kg - milligrams per kilogram
mg/L - milligrams per liter
EPA Method 1631 detection limit - 0.2 ng/L
EPA Method 7471A detection limit - 0.1 mg/Kg
EPA Method 160.2 detection limit - 10 mg/L
Discharge - Stream discharge (Q) in cubic feet per second (cfs), calculated using flow meter and cross-sectional area of stream channel
Air transfer - Lab DI water transferred from lab bottle to sample bottle following method desrcibed in workplan

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APPENDIX A

Health and Safety Plan

State of Oregon Department of Environmental Quality

State of Oregon
Department of
Environmental
Quality

SITE HEALTH AND SAFETY PLAN (HASP)
Black Butte Mine, ECSI #1657

PREPARED BY: Bryn Thoms DATE: 3/17/04

SITE VISIT APPROVED: YES ☐ NO ☐

APPROVED BY: _____ DATE:
Gene Rushing, DEQ Health and Safety Manager

And _____ DATE:
Marilyn Daniel, WR CU Manager

A. GENERAL INFORMATION

SITE NAME: Black Butte Mine

SITE LOCATION/SIZE: The site is located in southern Lane County approximately 15 miles south of Cottage Grove on London Road. Site coordinates at the entrance gate are 43.58012, -123.07020. Mine access to site is by driving south on London road from I-5 in southern Cottage Grove, continuing to the Weyerhaeuser Calapooya Tree Farm gate. Turn left over Garoutte Creek before the tree farm gate (end of public road) and enter Michael Pooler's gate on Land and Timber Company Property (owner of Black Butte Mine Site).

The former mine site area is approximately 40 acres in size, which accounts for the main mill area and associated tailings piles. The adits and stoped ore body area are included in the larger area of several tax lots which is approximately 470 acres.

SITE DESCRIPTION: (Attach map)
Black Butte Mine is an abandoned mercury mine which ceased operations in 1969. The site consists of a mill area where ore crushing and furnace operations were conducted, in addition to the larger area consisting of adits, shafts, and stoped glory holes. There were two furnaces at the site, the older one, which is located to the south of the main entrance road and main tailings pile has elevated levels of mercury in shallow soil. The newer furnace area also has elevated levels of mercury, but in smaller waste piles and too a lesser magnitude. Terrain is steep and forested. The site is accessed by small gravel roads with some obstructions like gates, fallen trees, and washouts. There are some dilapidated buildings on site and some steep loose slopes. The attached maps presents access to the site and the main site features.

HISTORICAL DATA:
Highest known Hg concentration in soil (2090 mg/Kg) at the site is located in the old furnace area. Other shallow soil Hg data in the old furnace area is consistently about 1000 mg/Kg. The new furnace area has Hg in shallow soil at about 200 to 700 mg/Kg. Hg in shallow soils throughout the majority of the site and surrounding property is between 1 and 10 mg/Kg. Arsenic and other heavy metals concentrations have not been assessed.

SCOPE/OBJECTIVE OF WORK:

Activities will include site prep activities for the Governor's Willamette Tour and also a removal assessment and potentially a removal to be performed by DEQ's contractor in early summer 2004. DEQ will conduct the site prep activities and will be on sight to oversee activities for the removal assessment and removal. DEQ will also be prepared to assist in soil and water sample collection activities to support the removal.

INVESTIGATION DATE: April 12, 2004

SITE CURRENTLY ACTIVE: Yes ☐ No ☒

BUDDY SYSTEM: Yes ☒ No ☐

DEQ SITE ORGANIZATION: List personnel who will be involved in the project and specify roles
Bryn Thoms, Hydrogeologist – Site Health and Safety Officer, and Field Activities Coordinator
Greg Aitken, Hydrogeologist – Overall Project Coordinator, WR AML Coordinator
Don Hanson, Hydrogeologist – Orphan Lead Worker, Potential Site Visit for Coordination

B. EMERGENCY INFORMATION

HOSPITAL NAME AND ADDRESS:
Cottage Grove Community Hospital.
1515 Village Drive
Cottage Grove, OR 97424

http://www.peacehealth.org/Oregon/WhoWeAreCGH.htm

PHONE NUMBERS: 541-942-0511

Directions to Hospital: (Attach map)
Drive North on London Road toward Cottage Grove, approx. 15 miles
Get on I-5 heading North (at south end of Cottage Grove at the London Road intersection with I-5)
Exit I-5 at exit number 174 (Row River Road)
Head east (right turn) on Row River Road approx. 1000 feet
Head northeast (left turn) on Thornton Road approx. 300 feet
Hospital is at intersection of Village and Thornton

COMMUNICATIONS: List the modes of communication available on site
Cell phone is spoty but does work at the entrance gate and sometimes on the main tailings pile
Michael Pooler has a land line phone at his residence at the entrance to the mine site
FRS two-way radios will be used amongst workers on site for coordination activities.

SITE EGRESS ROUTE:
Leave site by main entrance road. Meet at entrance gate by Pooler's residence.

C. HAZARD EVALUATION INFORMATION

CHEMICAL HAZARD(s):

The list of potential chemicals is based on historic activities at the site. (Attach MSDSs if available.)

Compound	OSHA TWA (mg/m3)	Action Level (mg/m^3)	Exposure Routes (Inhalation, dermal, etc...)	Symptoms of overexposure	Odor
Mercury	0.1	0.05 (NIOSH)	Inhalation	Irrit. eyes and skin, cough	none
Arsenic	0.5	0.01 (NIOSH)	Inhalation	Irrit. eyes	varies

PHYSICAL HAZARD(s): Check applicable hazards

Confined space	☐	Note: requires confined space entry permit
Noise	☒	
Heat/cold stress	☒	
Water	☐	
Uneven surfaces	☒	
Traffic	☒	
Other	☐	Specify:

D. EXPOSURE INFORMATION

ROUTE(S) OF EXPOSURE:

Inhalation ☒ Dermal ☒ No exposure expected ☐

OVERALL CHEMICAL EXPOSURE (Potential):

Serious ☐ Moderate ☒ Low ☐ Unknown ☐

OVERALL PHYSICAL HAZARD (Potential):

Serious ☐ Moderate ☒ Low ☐ Unknown ☐

E. CONTROL MEASURES

PERSONAL PROTECTIVE EQUIPMENT:

Level A ☐ (SCBA, fully encapsulated suit, chemical resistant gloves and boots)
Level B ☐ (SCBA, chemical resistant clothing, chemical resistant gloves and boots)
Level C ☒ (Air purifying respirator, chemical resistant clothing)
Level D ☐ (Coveralls, safety boots, shoe splash, goggles)

RESPIRATOR: 1/2 mask ☐ Full-face APR ☒ Escape ☐ SCBA ☐ as appropriate
Cartridge Type(s):

BODY: tyvek ☒ saranex ☐ (avail) other ☐ Specify:

HEAD: hardhat ☒ safety glasses ☒ face shield ☐ earplugs ☒

GLOVES: yes ☒ no ☐: outer ☒ inner ☒ Type: Solvex/heavy petroleum gloves outer for heavy work, nitrile inner. Nitrile only for sampling

FOOTWEAR: safety shoes ☐ rubber boots ☒ booties ☐

DECONTAMINATION PROCEDURES: dry ☐ wet ☒ stationary ☐
Describe: Remove soil attached to rubber boots or heavy petrol gloves with brush and soapy water and tapwater, drain to soil on the main tailings pile (lower concentrations of Hg). Nitrile and tyvek disposed in subtitle D waste stream.

AIR MONITORING EQUIPMENT:

Photoionization Detector	☐	Combustible gas indicator	☐
Oxygen meter	☐	Gastech	☐
Four way gas meter	☐	Hg vapor meter	☒
Detector tubes	☐		

OTHER AIR MONITORING EQUIPMENT (Specify):
A mercury vapor meter will be used during assessment and cleanup activities near the two furnaces due to the elevated levels of mercury and anectodal evidence suggesting that these area may have elevated levels of elemental Mercury.

SPECIAL AIR MONITORING PROCEDURES/LIMITATIONS: During assessment and cleanup activities near the furnaces, a mecury vapor meter will be used. The action level 0.05 for a one-time reading. Also, during any cleanup activities in the furnace/mill/tailings areas, if visible dust is generated, water will be applied to control dust. If visible dust still remains, workers in the exclusion zone will upgrade to Level C.

F. SAFETY

The following is a general checklist for site safety observations; it is intended for use as a general guide for the Site Safety Officer (SSO), but does not preclude the need for additional safety inspections that might be needed. A completed Job Safety Analysis (JSA) can be attached to this plan to augment this section.

☐	An **on-site safety briefing** will be conducted each day;
☐	Contractor supplied **Site Health & Safety Plan (HASP)** will be posted in an easily accessible location;
☐	First Aid/CPR trained person will be on-site; local fire and haz mat will be briefed

☐	A **first aid kit** will be readily available on site;
☐	Each **person's responsibilities** will be known;
☐	**Physical and chemical hazards** will be identified and addressed,
☐	All personnel will have **proper levels of protection** and equipment as determined in this HASP and onsite by the SSO.

☐	**Emergency scenario plans** will be discussed, including kill switches, hospital routes, and location of first aid kit(s);
☐	**Heat and cold stress hazards** will be identified and discussed;
☐	Personnel will wear ANSI approved **safety boots and hard hat**;
☐	**ANSI-approved safety glasses** will be worn at all times
☐	**A current approved ABC rated fire extinguisher must be stationed nearby**;
☐	Personnel will wear OSHA-approved **ear protection** for sound levels exceeding 85 dba;
☐	Tools will be used only for their intended purposes;
☐	Call before you dig Oregon Utility Notification Center (800) 332-2344 or (503) 246-6699
☐	
☐	
☐	
☐	
☐	
☐	

ADDITIONAL NOTES:

All site personnel have read the above plan and are familiar with its provisions.

	Name	Signature
Site Safety Officer	Bryn Thoms	_____
Project Manager	Greg Aitken	_____
Other Site Personnel		_____
Other Site Personnel		_____
Other Site Personnel		_____
Other Site Personnel		_____
Other Site Personnel		_____